The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XIX. No. 7
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JULY, 1922

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

The picture to the right, taken October, 1918, shows the RIC-WIL Sectional Insulated Tile Conduit being installed at a public park in a western city. Size of conduit 14 inch, housing two 3″ hot water flow and return pipes for heating; also, one 1½″ and one 1″ domestic hot water service pipes.

Conduit supported and protected by RIC-WIL Interlocking Base Drain.

Depth of conduit below grade 3′6″ to center.

The two pictures below of the same job were taken in March, 1922, or after four heating seasons in use. The insulation moulded to the inside of the tile was sticking tightly to the tile and to all appearances was like new. The base drain provided perfect underdrainage and solid foundations for the conduit, piping and roller expansion supports all of which were working as intended they should.

Since there can be no change in the materials used in the RIC-WIL METHOD, being all mineral of proven permanent qualities, this job will remain in its present efficient condition indefinitly.

RIC-WIL METHOD

OF INSULATING UNDERGROUND STEAM OR HOT WATER PIPES FOR HEATING OR POWER TRANSMISSION SYSTEMS

THE RIC-WIL COMPANY

CLEVELAND, OHIO

Agents in principal cities.

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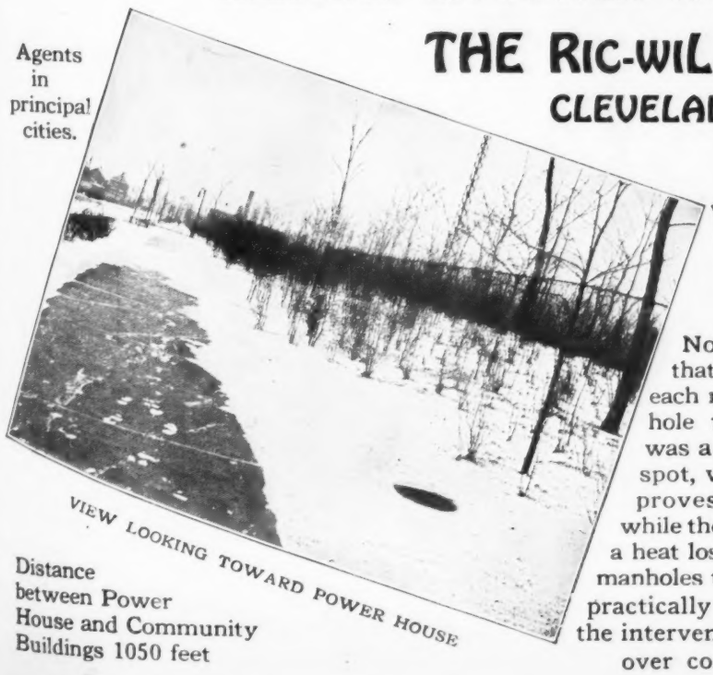


VIEW LOOKING TOWARD POWER HOUSE

Distance between Power House and Community Buildings 1050 feet

Note that at each manhole there was a bare spot, which proves that while there was a heat loss at the manholes there was practically none at the intervening space over conduit.

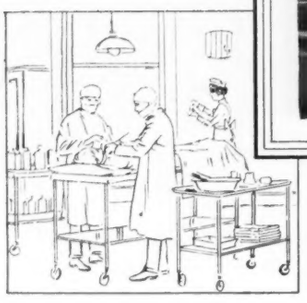
VIEW LOOKING TOWARD COMMUNITY BUILDING

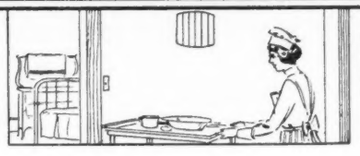
Official weather report time picture was taken 27° above zero. Total snowfall 1 inch.

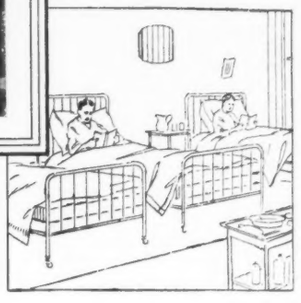
ST. MARY'S HOSPITAL, ROCHESTER, MINNESOTA

Architect—
C. H. Johnston,
St. Paul, Minnesota

Heating & Ventilating Contractor—
F. J. Spriggs,
St. Paul, Minnesota







CAN you think of a higher tribute to the excellence of Clarage Kalamazoo Multiblade Fans than to find that they were selected for ventilating the new addition to St. Mary's Hospital at Rochester, Minn? St. Mary's, where the famous Mayo Clinics are held and where only the very best is sufficiently good, has installed fifteen Clarage fans to keep the entire hospital supplied with clean, pure fresh air from the out-of-doors.

If you are unfamiliar with the high efficiency and dependable qualities of Clarage equipment, we will gladly mail you catalog No. 52 and have one of our sales-engineers call at your office.

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BRANCH OFFICES IN PRINCIPAL CITIES

Main Office and Factory, KALAMAZOO, MICHIGAN

CLARAGE KALAMAZOO Multiblade Fans

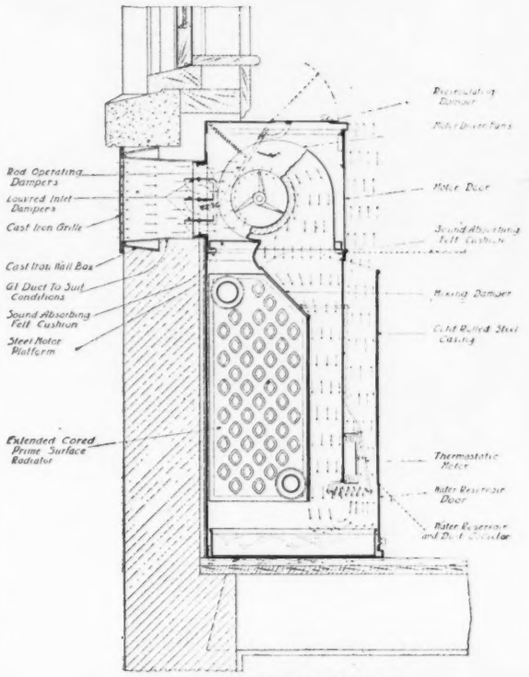
MANUFACTURERS OF FANS, BLOWERS, ENGINES, ETC.

THE MECHANISM OF THE PEERLESS UNIT

A FEATURE

A perfect mixing damper is necessary to properly control room temperature.

Overheating of rooms in mild weather is a common fault with most unit systems due to improperly designed mixing dampers.



The Peerless Mixing Damper will keep your rooms just as comfortable in mild as in severe weather, because it can be so adjusted as to by-pass ALL or any portion of the air around the radiator. It can be arranged for either hand or thermostatic control.

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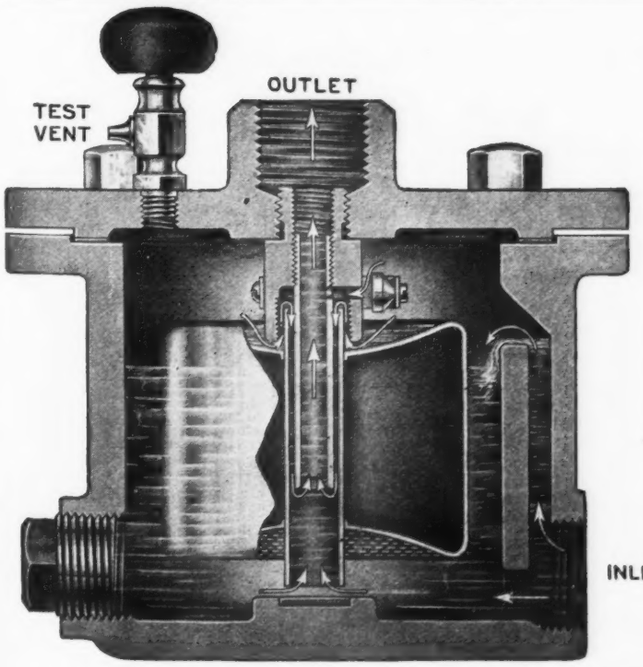

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DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

FOR DIRECT OR INDIRECT COILS OR ANY LOCATION WHERE LARGE QUANTITIES OF WATER ARE TO BE DISCHARGED

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

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For Water and Steam

Various Sizes

Imico Vacuum Heating System

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Manufactured by

ILLINOIS MALLEABLE IRON CO. Chicago, Ill.

"Oil City" Boilers for Heating

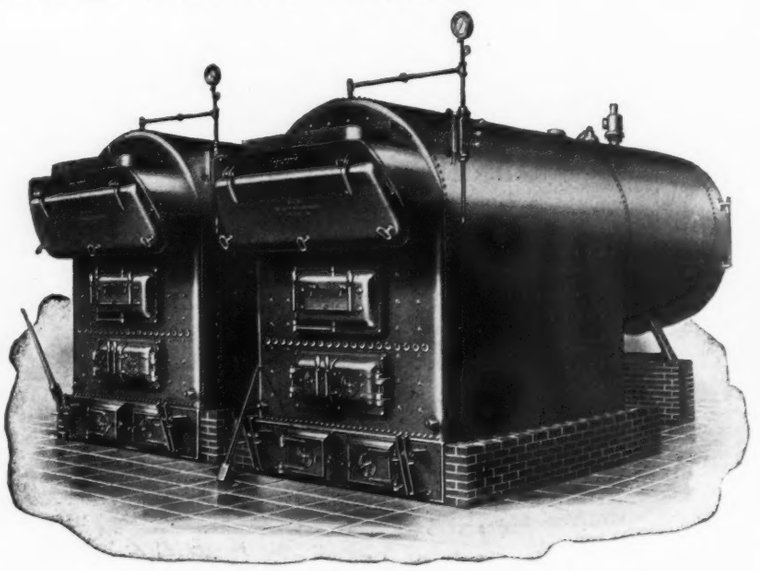
Return Tubular Portable Firebox

Will burn any kind of fuel,—hard or soft coal, oil, gas or lignite. Note use of high firebox, giving ample combustion area to make possible the use of low-grade fuels.

Why "Oil City" Boilers are Ideal for Heating Work:

These boilers are adaptable for Apartments, Churches, Club Houses, Court Houses, Hospitals, Garages, Hotels, Office Buildings, Large Residences, Post Offices, Schools, etc., because they are Safe, Efficient, Dependable, and, being Self Contained, require little attention.

Circular H-5, H-7, H-12, H-13, gives Full Specifications, Ratings and Weights.



Built of Steel, in Accordance with the A. S. M. E. Code

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SAN FRANCISCO, CAL. ST. PAUL, MINN. DENVER, COL. HOUSTON, TEXAS

Investigate the stack gases

Carbon Dioxide (CO_2) is a gas formed by the ***complete*** combustion of coal. Investigate the stack and breeching gases. If they show a high percentage of Carbon Dioxide it proves that the boiler is doing its job and is burning its coal completely.

Tests made of Kewanee Smokeless Boilers always show a high percentage of Carbon Dioxide. A proof of high efficiency.

KEWANEE BOILER COMPANY
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Steel Heating Boilers, Radiators, Tanks, Water Heating Garbage Burners

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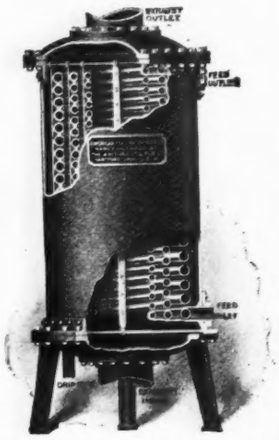
KEWANEE

WHITLOCK TYPE A
Industrial Heater
In sizes from 5 to 500 H. P.



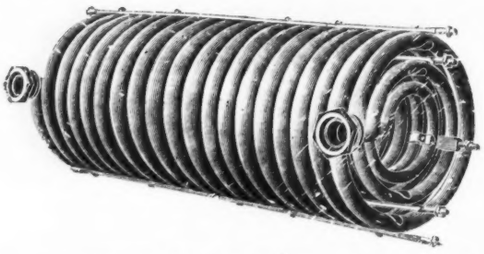
THIS type of heater insures perfectly clean feed water uncontaminated with cylinder oil from the exhaust steam.

The steam passes through the shell, the area of which is several times that of the exhaust pipe, making back pressure impossible.

Where ends of the fittings pass through the shell, glands are provided which may be replaced from the outside without disturbing the piping.

Pure Copper Heating Surface

is composed of coils of pure seamless drawn copper tubing brought together into common inlet and outlet by our patented brazing metal manifolds. All joints are made by LAPPING and BRAZING, no threaded or soldered joints being employed within the shell. The feed water passes through the coil and comes into contact with nothing except copper, eliminating the possibility of rusting and corrosion.



Consult WHITLOCK Engineers about your heater requirements.

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World's Largest Manufacturers of Service Water Heaters

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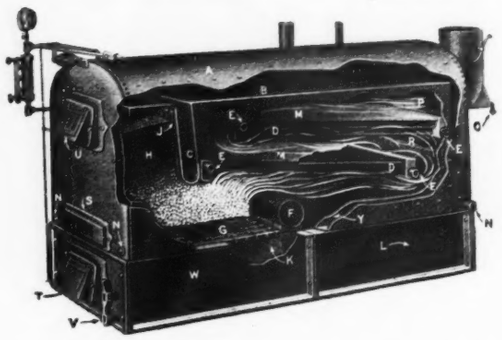
"Have Everlasting Copper Tubes"

INVESTIGATE

The Latest Herbert Magazine Water Tube Smokeless Boiler



These are a few of the Features

(1) No smoke after the fire is thoroughly started. (2) No Flues to clean. (3) Burns Soft Coal Successfully. (4) Carries steam from twelve to fifteen hours with one fire. (5) Has downdraft and direct draft to suit weather conditions. (6) It is all shell surface, which means economy. (7) Can be set in brick, which gives one more return of the hot gases. (8) No Brick Arches or other flimsy devices. (9) Natural draft and the highest economy. (10) Built in steam sizes from 500 square feet to 25,000 square feet

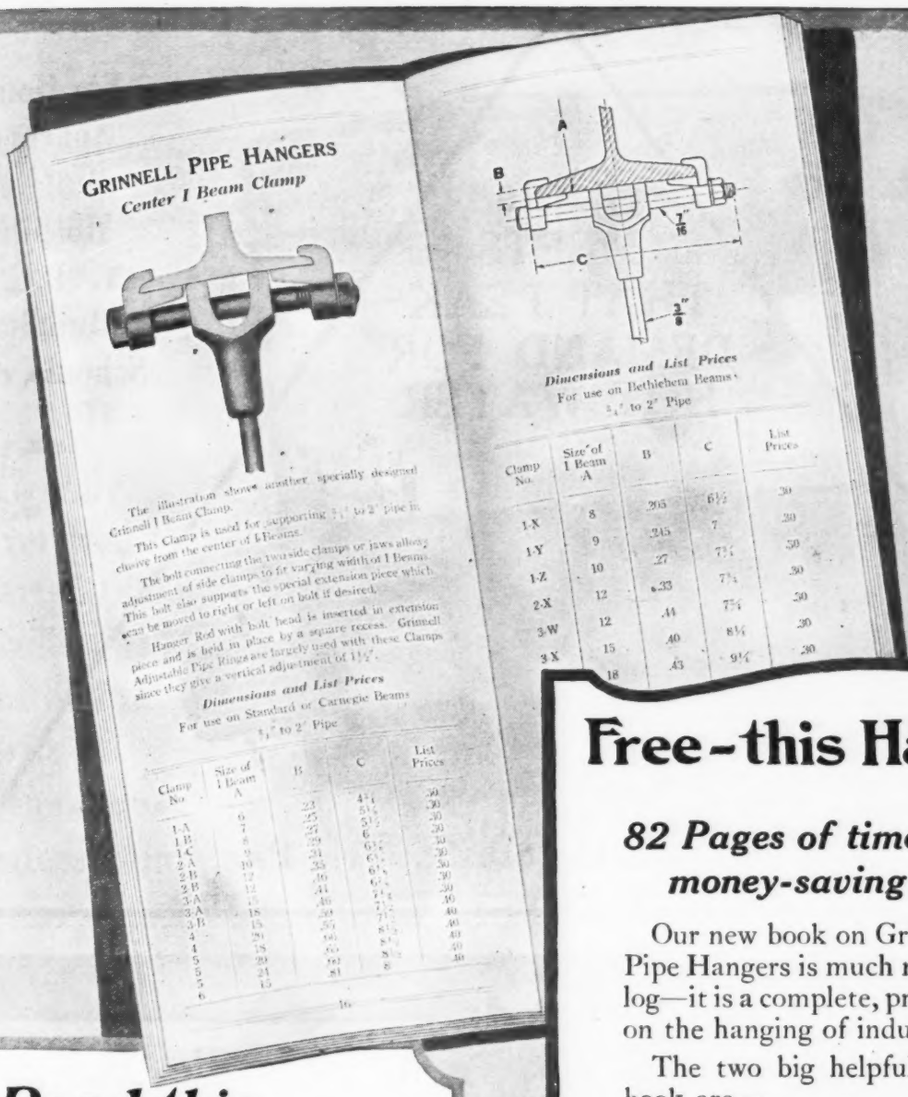
HERBERT

Has combined the downdraft feature with the direct draft and dispensed with the objectionable parts of both.

HERBERT BOILER COMPANY

Root & LaSalle Sts.

Chicago, Illinois



GRINNELL PIPE HANGERS

Center I Beam Clamp

The illustration shows another specially designed Grinnell I Beam Clamp.

This Clamp is used for supporting ¾" to 2" pipe in chuvie from the center of I Beams.

The bolt connecting the two side clamps or jaws allows adjustment of side clamps to fit varying width of I Beams. This bolt also supports the special extension piece which can be moved to right or left on bolt if desired.

Hanger Rod with bolt head is inserted in extension piece and is held in place by a square recess. Grinnell Adjustable Pipe Rings are largely used with these Clamps since they give a vertical adjustment of 1½".

Dimensions and List Prices

For use on Standard or Carnegie Beams

¾" to 2" Pipe

Clamp No.	Size of I Beam A	B	C	List Prices
1-A	6	.23	4½	.30
1-B	7	.25	5½	.30
1-C	8	.27	6	.30
2-A	10	.29	6½	.30
2-B	12	.31	6¾	.30
2-B	12	.41	6¾	.30
3-A	15	.46	7¼	.30
3-A	18	.50	7½	.40
3-B	15	.55	8½	.40
4	20	.60	8½	.40
4	18	.60	8½	.40
5	20	.63	8	.40
5	24	.81		
6	15			

16

Dimensions and List Prices

For use on Bethlehem Beams

¾" to 2" Pipe

Clamp No.	Size of I Beam A	B	C	List Prices
1-X	8	.205	6½	.30
1-Y	9	.245	7	.30
1-Z	10	.27	7¼	.30
2-X	12	.33	7¾	.30
3-W	12	.44	7¾	.30
3-X	15	.40	8¼	.30
	18	.43	9¼	.30

Read this~

B. MacKenzie
349 North Elm Street

Grinnell Company, North Charlotte, N. C.

Greensboro, N. C.
March 15, 1922.

Gentlemen:—

Attention of Mr. C. W. Christian.

I have your catalogue of Grinnell Company adjustable pipe hangers, for which I thank you. I have gone over this catalogue very carefully and I think it is about as complete a line of hangers as I have ever seen catalogued and I don't understand why the General Fire—or the Grinnell Co.—did not put this catalogue out long ago. You know as well as I do that one of the big troubles on a job of any size is the hangers for our pipe. As a rule we are confined to one or two models of hangers and when it comes to anything outside of the ordinary you have to have it made which means delay to say nothing about the expense. I am satisfied if your Company will place this catalogue in the hands of all the good engineers and architects that they will be well paid for their trouble. We will be very glad not only to specify your hangers on our work but to use them as well.

Thanking you for remembering us in the matter and with kindest regards from the writer.

Yours very truly,

M-L (S) B. MacKenzie

Free-this Handbook~

82 Pages of time-saving, money-saving infotmation

Our new book on Grinnell Adjustable Pipe Hangers is much more than a catalog—it is a complete, practical handbook on the hanging of industrial piping.

The two big helpful features of the book are—

(1) Page after page of mechanical drawings and carefully compiled dimensional and engineering data on pipe hanging equipment which save many hours of scaling and computing in the preparation of plans and estimates.

(2) Complete descriptions of the many different types of Grinnell Adjustable Pipe Hangers, including hangers to meet practically every condition encountered in industrial pipe installation.

We will be glad to send you, free of charge, as many copies of this Hanger Handbook as your staff can use to advantage. Address Grinnell Company, Inc., 280 W. Exchange Street, Providence, R. I.

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Automatic Sprinkler Systems | Steam & Hot Water Heating Equipment | Humidifying and Drying Equipment | Fittings, Hangers and Valves | Pipe Bending, Welding, etc. | Power and Process Piping

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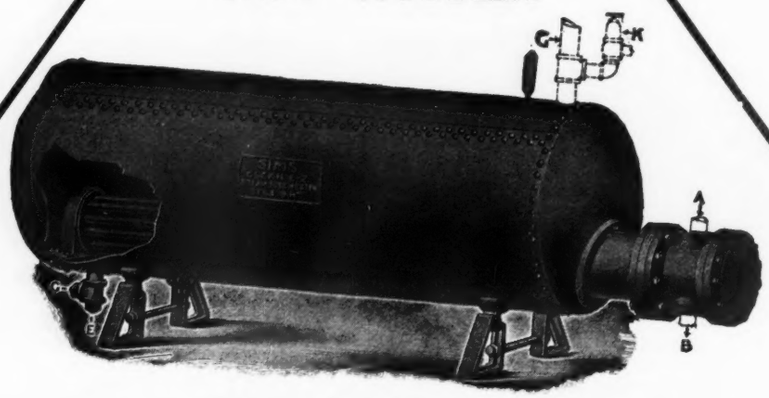
Sims Clean E-Z Steam Tube Heater

Especially Designed for Supplying Large Quantities of Hot Water

Sims MEETS THAT PEAK DEMAND FOR HOT WATER



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"We keep others in Hot Water"

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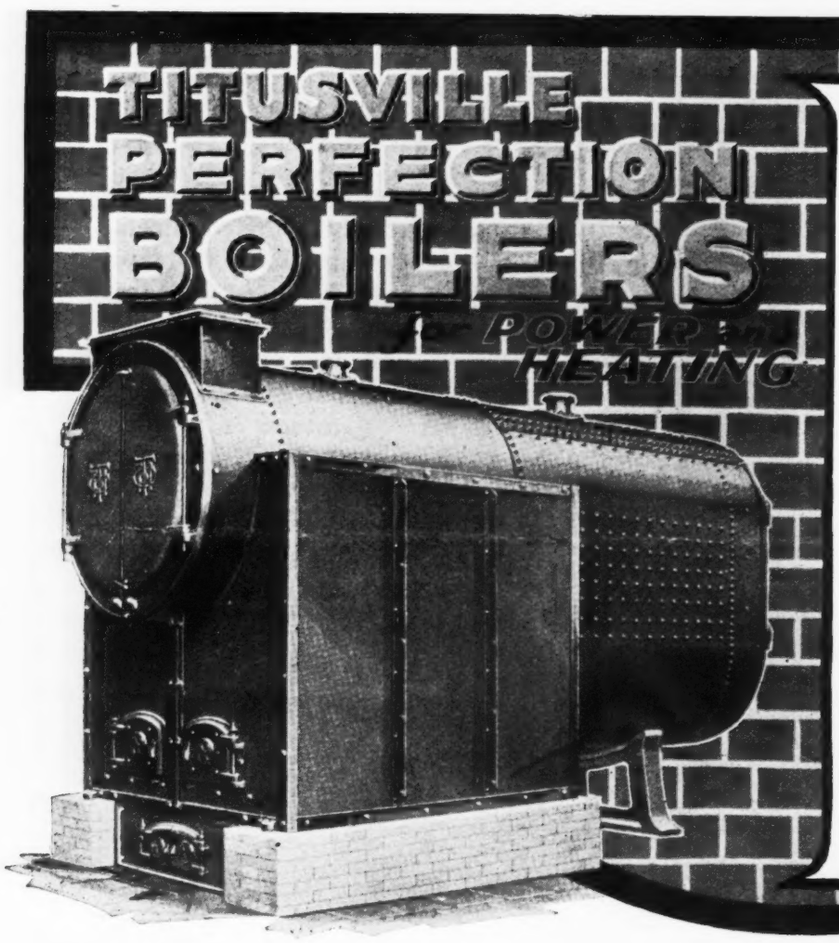

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are built in exact accordance with A. S. M. E. Boiler Code.

ALL our boilers are built of high-grade open hearth steel, properly riveted and thoroughly inspected during construction—tested and guaranteed to be perfect in every way before shipment.

The fire-box of the Perfection Boiler is lined with special fire-brick and made air-tight by the steel casing.

Specifications and complete data will be found in our new catalog, 81, a copy of which we will gladly send on request.

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INTERNATIONAL HEATER COMPANY
Full page advertisement in the Saturday Evening Post, May 13, 1922
Full page advertisement in the Saturday Evening Post, August 12, 1922.
Full page advertisement in the Country Gentleman, August 26, 1922

SELLING HEAT COMFORT AND RINGING CASH REGISTERS

STRONG human interest appeal of comfortable home life illustrations similar to those reproduced here, in connection with truthful, unexaggerated, non-technical copy, occupies full pages in the *Saturday Evening Post*, *Country Gentleman* and many Farm papers of National circulation.

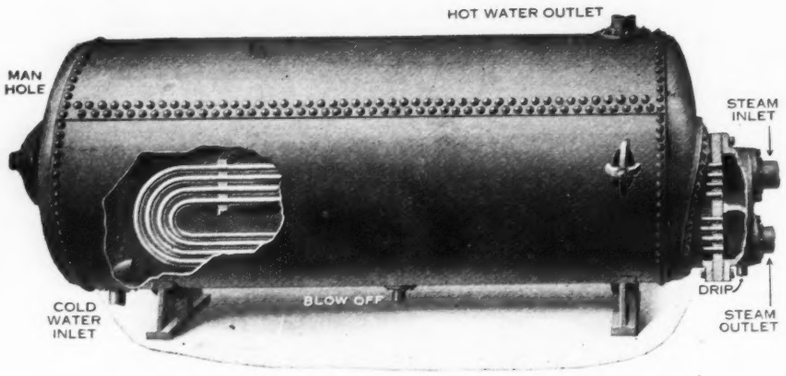
By this method of publicity we secure good will for our dealers and ourselves, build a reputation for the name "INTERNATIONAL" as applied to heaters, create consumer acceptance and a desire for the home comforts an INTERNATIONAL HEATER provides.

This advertising is as sound as the product it advertises. No extravagant claims, no knocking of any type or system; just a straight message of good heating, from the shoulder how and where to obtain it.

Everything you do to tie up your name with the name INTERNATIONAL serves to identify you with these advertisements and to increase your sales of *Economy Boilers*. You may obtain full benefit from our National advertising by using various ways of local publicity such as newspaper advertisements, circularizing campaigns, movies slides, etc.

Send for Folder of Free Advertising Aids and let us explain how you may benefit by identifying your store as headquarters for *Economy Boilers*.

INTERNATIONAL HEATER COMPANY
Utica, N. Y.



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Tell us Your requirements

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Water Heating Engineers
Manufacturers of Heaters
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Easily installed in any room having chimney and easily connected to hot water radiators in adjoining rooms—and on floor above.

The Cheery Open Fireplace Appeals to Every Home Lover.

'RADIO'
Heat is Hot Water Heat—and a cheery fireplace too!

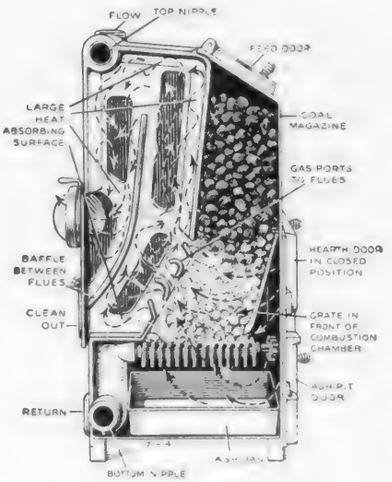
'RADIO'

Hot Water Heat for Every Room

Open Fireplace Hot Water Radiator

Magazine-feed Downdraft Smokeless Burns Hard and Soft Coal

Made in Five Sizes Conservatively rated 300 to 800 Sq. Ft.



Patented Jan. 24, 1922
Other patents pending

FUEL-ECONOMY, heating-efficiency, ease of operation and attractiveness of design are developed to the highest degree in the 'RadiO' Open Fireplace Radiator.

It is the only hot water heating unit with an open fireplace—the only small coal-burning heater having a magazine-feed and embodying the downdraft principle of combustion.

All-cast iron construction. An ornament in any room.

The thousands of small houses to be erected or remodeled mean a busy, prosperous season for the heating man who will reach out for business with the 'RadiO' Open Fireplace Radiator—and its twin brother for cellar installation—the 'RadeX' boiler.

Installations are easily and quickly made in new houses and old—without (or with) cellars.

Suburban Homes	Offices in unheated buildings
Cottages	Recreation Halls
Bungalows	Garages
Farm Houses	Greenhouses
Stores	Etc.
Restaurants	

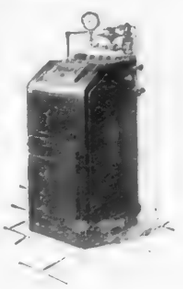
'DomiC' Water Heater

An auxiliary heater for domestic water supply. Installed entirely on outside of boiler. All cast iron with provision for expansion. Three sizes.

'RadeX' Boiler
A Millionaires' Boiler for Small House and Small Purse

'RadeX' boilers (steam and water, for cellar installation) possess all the fuel saving, labor-saving and money-saving advantages of the most expensive types of magazine-feed downdraft boiler—*at a popular price.* Built on lines of the 'RadiO' with water front instead of fireplace. Five sizes.

All 'RadeX' Boilers are tapped for the 'DomiC' Water Heater.



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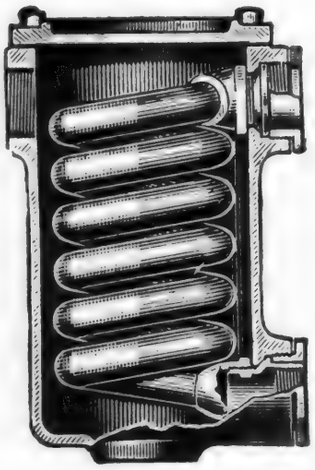
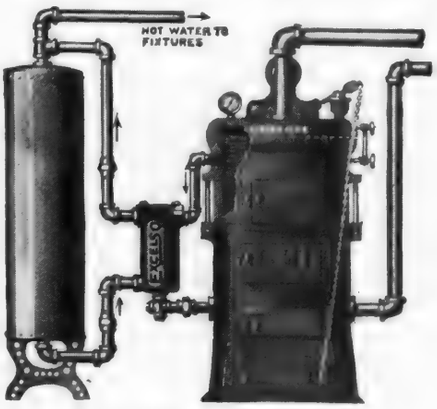
EXCELSO



Sectional View



Typical Installation

"I wish to say that I have found EXCELSO business a very good proposition and I appreciate the manner in which you have treated me in furthering the sales of EXCELSO Heaters."

A. H. Karl, Mt. Vernon, N. Y.

You can build up a profitable business with the Excelso Water Heater, The Original—First in The Field.
Guarantees an abundant supply of hot water during the heating season with no expense for gas, electricity or a separate fire.
Easily installed; connects on the outside of any steam or vapor heating plant.
Our free advertising and cooperation will bring you many prospects.
No packing necessary because leaks are positively eliminated with PATENTED CROUND JOINTS
Endorsed and sold by the following boiler manufacturers—

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Richardson & Boynton Co.
Richmond Radiator Corp.
Standard Heater Co.
Utica Heater Co.
Burnham Boiler Corp.
Pierce, Butler & Pierce Mfg. Co.
United States Radiator Corp.
International Heater Co.
Boynton Furnace Co.
The Wm. H. Page Boiler Co.
Gurney Heater Mfg. Co.
Thatcher Furnace Co.
Agendroth Bros.
Monitor Bi-Loop Radiator Co.

Also by Plumbing Supply Jobbers everywhere

EXCELSO

Write for details and full information of our advertising cooperation, prices, discounts, etc.

Excelso Specialty Works, 117 Clinton St., Buffalo, N. Y.

Special New York Sales Representative, John G. Kelly, 137 East 43rd Street
New England Representative, Daniel L. Hanson, 46 Cornhill, Boston, Mass.

A Tribute—

That this beautiful new Park Avenue Baptist Church, New York City, formerly known as the Rockefeller, Fifth Avenue Church, should have the Novelty Carburetor Boiler, is one of the highest possible tributes to this remarkable heating apparatus.

This wonderful boiler is now operating in every type of building in all sections of the country burning all grades and sizes of hard coal or soft coal without smoke. In the self-adjusting carburetor chamber all smoke, gases and carbon, ordinarily wasted, are mixed with oxygen from the air and ignited. Thus greater heat is obtained, less fuel required.

Write for illustrated folder and price list

ABRAM COX STOVE COMPANY

General Offices;

PHILADELPHIA

NEW YORK CHICAGO

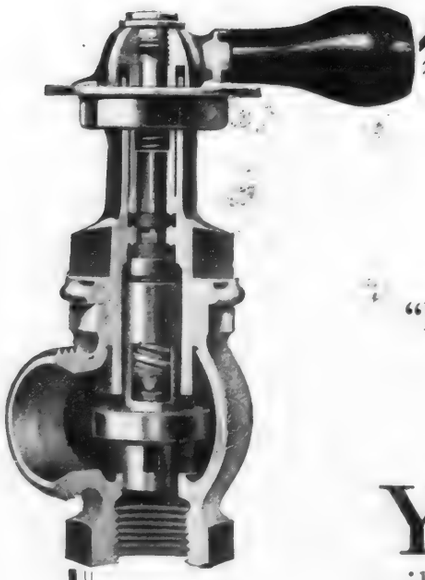
ESTABLISHED 1847

Henry C. Pelton, New York
Allen & Collens, Boston
Associate Architects
H. Hall Marshall,
Heating Engineer
Marc Eidlitz & Sons, *Builders*
T. F. Hall, Inc.,
Heating Contractor

A cast-iron sectional, side-feed, up-draft, low water line smokeless boiler. Easy to install, simple to operate, exceptionally durable.

Made small enough for the home — large enough for churches, schools, theatres, office buildings, ware houses and factories.

1847 **NOVELTY CARBURETOR BOILER** 1922



A Turn to the Right

is when you write in your Specifications

"Lavigne Packless Steam Radiator Valves"

YOU are then taking the thing by the right end of the handle and giving your client valves that will not leak steam, air or water; valves that eliminate the trouble of packing, because they are *packless,* valves that are of simple and correct design; in short, valves that are built right to stay tight.

Made in Angle, Globe, right or left Corner styles; furnished with round wheel or plain lever handle, graduated dial with lever handle, or round wheel, extension type with lever handle or round wheel, also lock shield, either plain or graduated.

Open quickly with a seven-eights turn of the handle, and close just as quickly; are correctly proportioned and properly manufactured of the highest grade materials for rugged service.

Our complete range of styles and sizes satisfies every requirement for Vapor, Vacuum, Central Station or Low Pressure Steam Heating Systems.

Your Jobber Can Supply You.

Commonwealth Brass Corporation

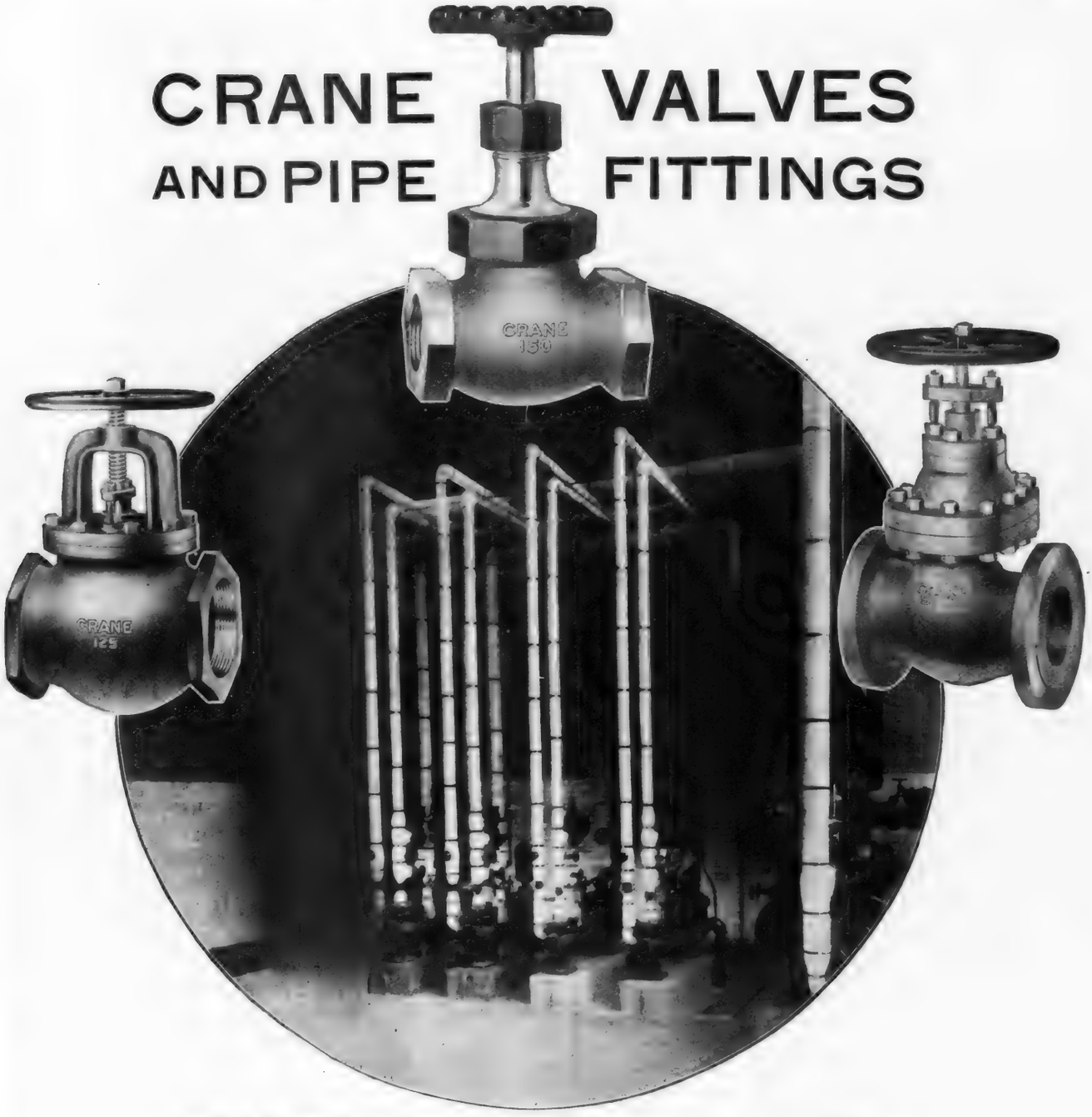
Detroit **Michigan**

NEW YORK
48 E. 41st Street

CHICAGO
332 So. Michigan Avenue

SAN FRANCISCO
68 Post Street

CRANE VALVES AND PIPE FITTINGS



VALVES of established wearing qualities, fittings that insure tight joints, and steam specialties that operate accurately under the exacting requirements of service, strikingly define our facilities for meeting all the demands of modern steam practice.

SALES OFFICES, WAREHOUSES AND SHOWROOMS:

BOSTON, SPRINGFIELD, HARTFORD, BRIDGEPORT, ROCHESTER, NEW YORK, HARLEM, ALBANY, BROOKLYN, PHILADELPHIA, READING, ATLANTIC CITY, NEWARK, CAMDEN, BALTIMORE, WASHINGTON, SYRACUSE, BUFFALO, SAVANNAH, ATLANTA, KNOXVILLE, BIRMINGHAM, MEMPHIS, LITTLE ROCK, MUSKOGEE, TULSA, OKLAHOMA CITY, WICHITA, ST. LOUIS, KANSAS CITY, TERRE HAUTE, CINCINNATI

FOUNDED BY R. T. CRANE, 1855

CRANE CO.

836 S. MICHIGAN AVE.

CHICAGO

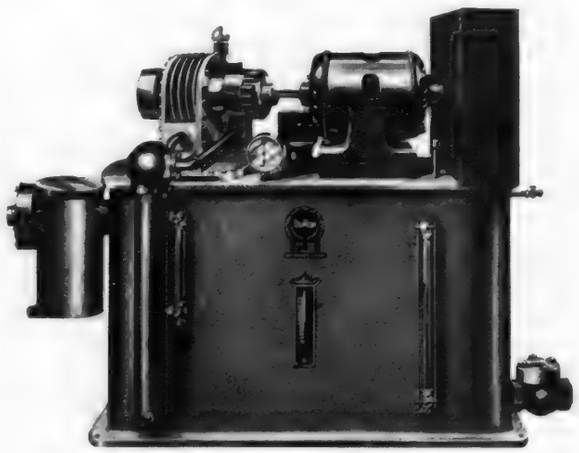
WORKS: CHICAGO AND BRIDGEPORT

INDIANAPOLIS, DETROIT, CHICAGO, ROCKFORD, OSHKOSH, GRAND RAPIDS, DAVENPORT, DES MOINES, OMAHA, SIOUX CITY, MANKATO, ST. PAUL, MINNEAPOLIS, WINONA, DULUTH, FARGO, WATERTOWN, ABERDEEN, GREAT FALLS, BILLINGS, SPOKANE, SEATTLE, TACOMA, PORTLAND, POCATELLO, SALT LAKE CITY, OGDEN, RENO, SACRAMENTO, OAKLAND, SAN FRANCISCO, LOS ANGELES

CRANE LIMITED — MONTREAL, TORONTO, VANCOUVER, WINNIPEG, CALGARY, REGINA, HALIFAX, OTTAWA.

CRANE-BENNETT, LTD. — LONDON, ENG.

We are manufacturers of about 20,000 articles, including valves, pipe fittings and steam specialties, made of brass, iron, ferrosteel, cast steel and forged steel, in all sizes, for all pressures and all purposes, and are distributors through the trade of pipe, heating and plumbing materials.



Better Heat
Less Fuel Cost
Only Half the Power

These are the advantages your customers get when you specify DuMoin Return Line Pumps. The explanation is simple. This pump is

built on an entirely different principle

from the old style pumps. The DuMoin pumps no hot water. No corroding, repair-inducing boiling water touches any working parts. Yet it quickly, quietly, efficiently and automatically draws the hot water from the pipes and forces it *still hot* into the boiler.

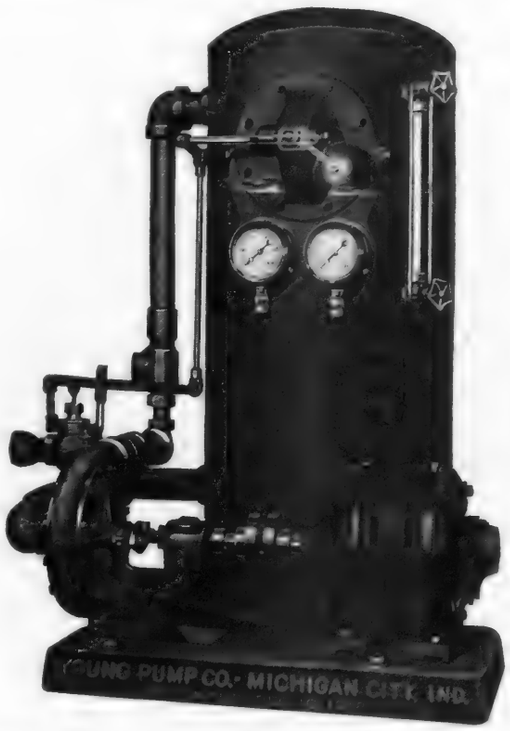
Instead of pumping hot water the DuMoin creates a vacuum on the tank beneath the pump. Then it automatically reverses, puts the tank under pressure for a fraction of a minute and forces the water back into the boiler.

Write today for Bulletin 16 giving full scientific explanations of the principle and operation of this better pump.

Thompson's DuMoin Vacuum Return Line Pump

Thompson Manufacturing Company

813 24th Street, Des Moines, Iowa



They Come This Way!

JUST as you see the "YVM" outfit in the above illustration—that is the way the Young Centrifugal Vacuum and Boiler Feed Outfits are shipped. *Complete in every detail!* When received on the job, it is only necessary to make pipe connection to the system and boiler and wire connection to the motor. Then all is ready for operation.

The "YVM" is the simplest outfit made. There are no valves, springs or other parts that require adjustment, wear out or cause repair expense. It has a very low maintenance cost—in fact, the outfit is *economical in every way.*

Made in six sizes to handle 4,000, 8,000, 16,000, 26,000, 40,000 or 65,000 sq. ft. of radiation; for continuous operation or automatic control, to meet any condition or pressure.

Young Pump Company

Michigan City **Indiana**

Chicago Office, 327 S. Lasalle St.

The Skidmore Hydro Turbine Vacuum and Boiler Feed Pump

The Latest Development in an Electrically Operated Device for Use with Return Line Steam Heating Systems

A high grade pump, bronze fitted throughout, with ball bearings.

Operates on an entirely new patented principle.

Positive removal of air and water from the system and return of water to the boiler without the use of overhead tanks or water legs.

As none of the internal parts are lubricated, it is impossible for any oil to be delivered to boiler in water.

Ease in installing, no piping, just connect to returns.

Minimum floor space occupied, all on one base.

No air can leak back into system through pump.

No close clearances on moving parts.

Constant efficiency.

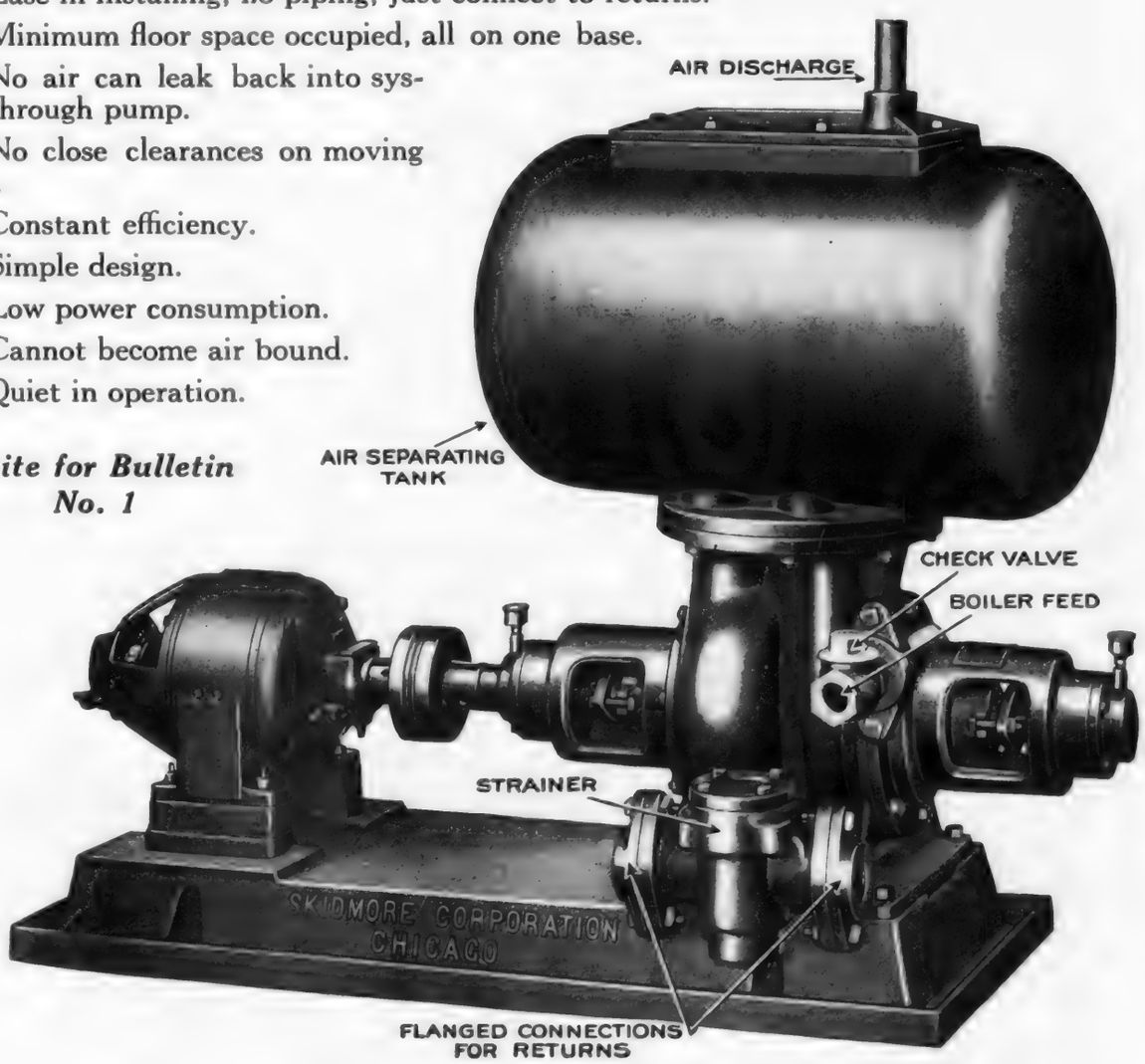
Simple design.

Low power consumption.

Cannot become air bound.

Quiet in operation.

Write for Bulletin No. 1



SKIDMORE CORPORATION

Office and Factory: 1535 Dayton St. **CHICAGO**

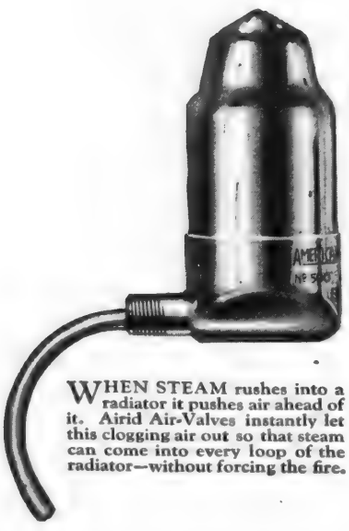
Down comes the price~

THE DEMAND for the Airid Air-Valve has justified this Company in putting its plants into large scale production. Large scale production makes possible a reduced price. ¶ On and after June 1st, you will be able to sell the Airid at $1.60 instead of $2.

National Advertising Behind Airid

BEGINNING in the early Fall the Airid will be advertised in such magazines as Saturday Evening Post, Literary Digest and American Magazine, and in leading Newspapers all over the country. ¶ The effect of this advertising will be to make thousands of families try *one* Airid Air-Valve. The one they try will send them back to you for many more.

Your jobber carries Airid and can supply you now.



WHEN STEAM rushes into a radiator it pushes air ahead of it. Airid Air-Valves instantly let this clogging air out so that steam can come into every loop of the radiator—without forcing the fire.

MADE AND GUARANTEED BY

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

1807 ELMWOOD AVENUE Dept. S-106 BUFFALO, N. Y.

AIRID

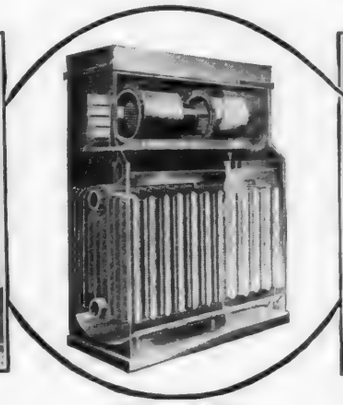
Air Valve

Rids the radiator of cold air

UNIVENT

"LIVE OUTDOORS-INDOORS"
(TRADE MARK)

Kate—a victim of poor ventilation



Phantom View

Fresh air from the window

Why Kate Didn't Graduate

Kate failed to graduate with her class. The teacher said she was "backward" but the family physician knew differently. Kate was simply a victim of poor ventilation.

The importance of good ventilation cannot be over-estimated. It is only necessary to quote from the Fifteenth Annual Report of the Educational Department of the University of the State of New York, which says that good ventilation has produced the following results:

"33⅓% increase in mental efficiency
50% decrease in days of sick leave
60-90% decrease in hospital death rates."

Your ideal of good ventilation is realized in the Univent—because in principle it is as simple and more positive than opening wide the windows—but without the cold, dangerous drafts.

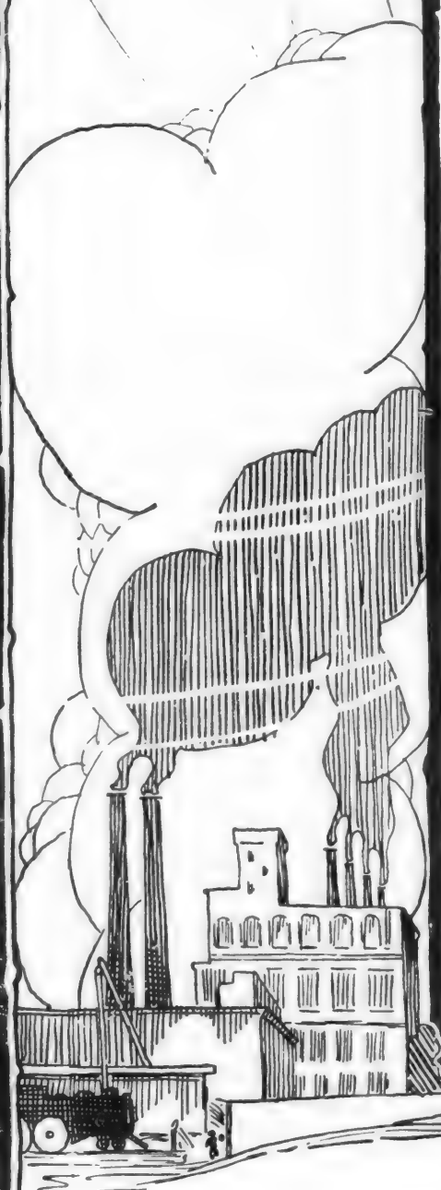
The Univent system is designed on a unit basis. Each room is heated and ventilated by its own individual Univent. There are no uncleanable ducts or flues. Each Univent draws fresh air directly from out of doors, heats it and thoroughly diffuses it throughout the room. The Univent is designed for schools and all buildings where mechanical ventilation is necessary.

The Univent system is the simplest system to install. It is more profitable for the contractor. No adjustment of dampers (which never stay adjusted) is necessary, yet distribution of air is always perfect. There is a lot of business in store for you in specifying and equipping the old schools in your vicinity with the Univent system.

***As a Heating-Ventilating Engineer**—you should know all about the Univent system. Send for a copy of our special 72-page Engineer's edition "Univent Ventilation." Please use your business letterhead.*

THE HERMAN NELSON CORPORATION, Dept. H1, *Moline,* Illinois

Hot or Cold Wet or Dry



Solving that New Problem for Consulting Engineers

New problems are daily confronting the Consulting Engineer. In every branch of industry the basic principles of Air Conditioning are being applied. What may be a new problem to one engineer is an old and solved problem to another.

And, when a new problem comes up—one that neither you nor our engineers have been confronted with previously—we have our completely equipped

AIR CONDITIONING LABORATORY

to go to. Here we reproduce conditions exactly as they are and then determine the ideal conditions for the particular process and product. The accurate interpretation of these tests and the best methods of treating many vexing Air Conditioning problems can always be arrived at in this way. There is no need for guess work.

Our laboratory and experience is at the service of Consulting Engineers.

Let us give you full information and catalog covering all phases of Air Conditioning work either thru one of our engineers or by correspondence. Such a request will in no way obligate you.

B. F. Sturtevant Company
Hyde Park - - - Boston

W. L. FLEISHER & CO., INC.
New York City
design and install all
STURTEVANT-FLEISHER
Air Conditioning Systems

Sturtevant
PUTS AIR TO WORK

Heatovent
(REG · U·S·PAT·OFF·)

UNIT HEATING AND VENTILATING SYSTEM

The Unit System is the latest Heating and Ventilating System for Banks, Clubs, Schools, Offices, Churches, Lodges, etc.

The Heatovent is the ideal Unit Heater, as it incorporates all of the best engineering principles and designs.

It is of simple artistic design, finished to harmonize with any interior.

It insures perfect ventilation at all times, free from any drafts.

Simple in construction and silent in operation, the Heatovent is always ready to serve you. It starts by pressing a button—it stops the same way.

The Cabinet encloses a special new style Steam Coil designed to give the highest possible heat transfer at low air velocity; it, also, encloses a pair of special slow speed Multiblade Fan Wheels direct-connected to a specially designed electric motor built to our specifications.

All of these special built features make the Heatovent the quietest and most economical Unit Heater now being manufactured.

The fresh air is drawn into the cabinet, tempered to proper degree, and then diffused into the room thru louvres near the top of the cabinet.

Our Engineering and Service Departments are ready to assist or cooperate with any Engineer or Architect by furnishing proper data and information for designing the Unit system for Banks, Offices, Clubs, Lodges, Schools, Churches, Auditoriums, Gymnasiums, etc., without any obligation.

WE ARE FURNISHING PROPER VENTILATION, NOT MERELY SO MUCH EQUIPMENT
BUCKEYE EQUIPMENT MEANS HIGHEST QUALITY AND SERVICE AT ALL TIMES

We still have some open territory for a few high grade selling organizations

BUCKEYE BLOWER CO.

COLUMBUS, OHIO

BRANCH SALES AND ENGINEERING OFFICES

BUCKEYE BLOWER CO.
324 Monadnock Bldg.
Chicago, Ill.

BUCKEYE BLOWER CO.
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BUCKEYE BLOWER CO.
1400 Broadway
New York, N. Y.

BUCKEYE BLOWER CO.
372 Whitehall St.
Atlanta, Ga.

At Last!

A SINGLE PIPE VAPOR SYSTEM

Simple to install
Efficient in operation
Low in cost

Descriptive matter sent on request

GORTON & LIDGERWOOD CO.

96 Liberty Street, New York

FISHER BUILDING, CHICAGO, ILL.

SPECIFY—USE

Barnes & Jones

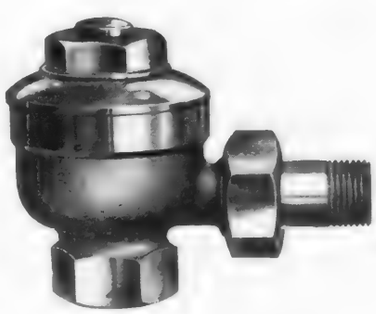
Modulation, Vapor and Vacuum Heating Apparatus

for EFFICIENCY
QUALITY
SERVICE

—The result of twenty years experience—

BARNES & JONES MODULATION VALVE

QUICK OPENING
NON-RISING STEM
RENEWABLE DISC SEAT
STURDY AND STRONG



BARNES & JONES
THERMOSTATIC RETURN VALVE

DOES WHAT IT IS DESIGNED FOR
—PASSES THE WATER OF CONDENSATION
—PREVENTS THE PASSAGE OF STEAM

BARNES & JONES

5 MELROSE ST. BOSTON, MASS.

Grand Central Terminal
New York City

Representatives
Principal Cities

WORLD'S MOST COMPLETE LINE HEATING SPECIALTIES

B & B All Metal Thermostat

The B & B Line

Have Absolute Control of the Heat

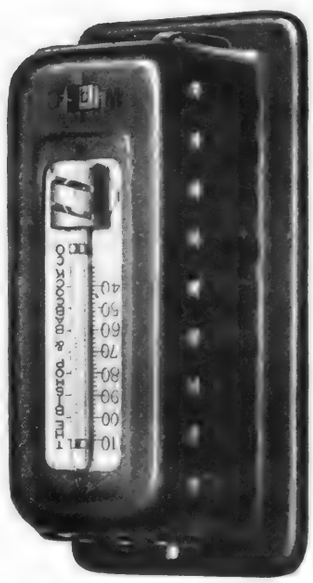
THE BISHOP & BABCOCK ALL METAL THERMOSTAT illustrated is the last word in simplicity. Note its complete mechanism, consisting of one moving part, which is the double seated air valve operated directly by the thermal member.

This air valve is a large port valve, with the operating stem, which moves up and down through the port, so that it cannot clog with dust or other foreign matter.

The thermal member is mounted on the frame, so that its operation is not affected by the expansion and contraction of the frame itself, due to cold walls.

THE BISHOP & BABCOCK ALL METAL THERMOSTAT will control the temperatures of the various rooms within less than one degree.

Literature sent upon request



B & B All Metal Stat Cover

BRANCH OFFICES

Boston, New York, Philadelphia, Richmond, Atlanta, Birmingham, Nashville, Dallas, Indianapolis, Charlotte, Oklahoma City, Kansas City, St. Louis, Chicago, Buffalo, Detroit, Milwaukee, St. Paul, Denver, San Francisco, New Orleans, Pittsburgh, Cincinnati, Montreal, Canada.

THE BISHOP & BABCOCK COMPANY

General Offices and Factories, CLEVELAND, OHIO

TRANE DAMPER REGULATOR

A TRANE PRODUCT

The Trane Sensitive Damper Regulator operates by boiler pressure. Responds instantly to fractional ounce pressure changes. Use it on any steam or vapor job. It is standard equipment for Trane Systems and one of the reasons why you should be familiar with

The Trane System of Vapor Heating
Trane Heating Specialities
Trane Pumps

Write for Bulletins

The Trane Company

La Crosse, Wis.

206 Cameron Avenue

BRANCHES AND SELLING CONNECTIONS IN THE UNITED STATES AT

Chicago	Philadelphia	Cleveland	Salt Lake City
New York	Buffalo	Detroit	Portland, Ore.
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Greensboro, N. C.

LA CROSSE TRANE WISCONSIN

THERMOGRADE

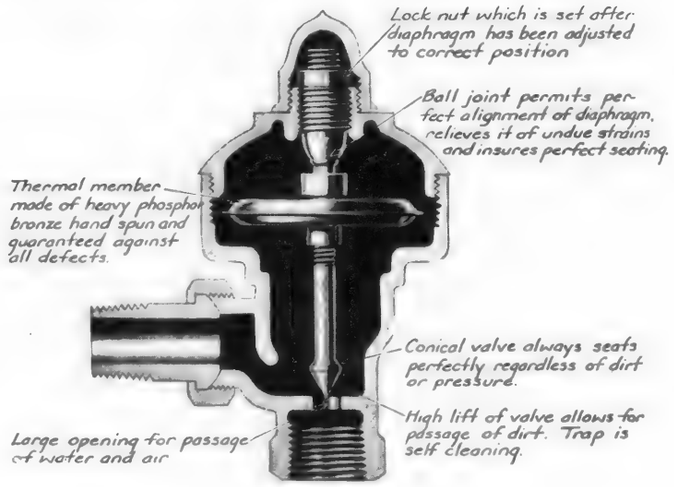
PRODUCTS

MADE EXCLUSIVELY IN OUR FACTORY AT WATERTOWN, MASS.

20 YEARS OF CONTINUED SUCCESS

You do not EXPERIMENT or TAKE A CHANCE where you specify and use THERMOGRADE PRODUCTS.

YEARS of Gradual Development and experience in the manufacture and application protects you fully.


Lock nut which is set after diaphragm has been adjusted to correct position
Ball joint permits perfect alignment of diaphragm, relieves it of undue strains and insures perfect seating.
Thermal member made of heavy phosphor bronze hand spun and guaranteed against all defects.
Conical valve always seats perfectly regardless of dirt or pressure.
High lift of valve allows for passage of dirt. Trap is self cleaning.
Large opening for passage of water and air

Factory Adjusted AUTO VALVE With Improved Interior

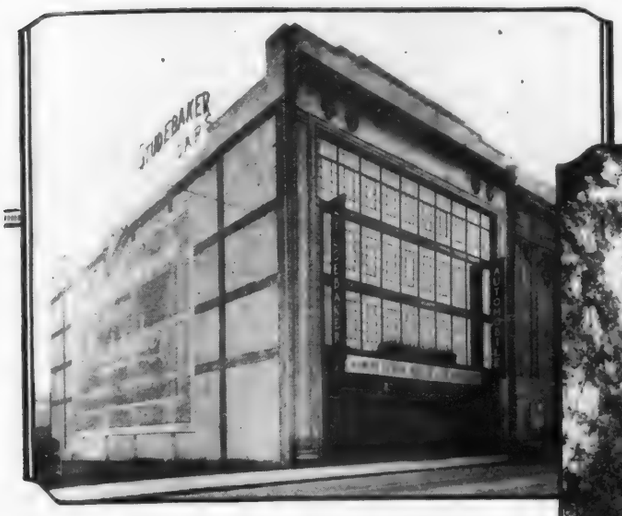
SPECIFY THERMOGRADE MODULATION OR VACUUM SYSTEM OF STEAM HEATING

THERMOGRADE VALVE COMPANY

GENERAL OFFICE & FACTORY

WATERTOWN, MASS.

BRANCH OFFICES IN ALL PRINCIPAL CITIES



Aaron Deroy Motor Car Co., Pittsburg. Adsco Heating

Residence of H. P. Cahill, Akron, Ohio. Adsco Heating from individual boiler.

No Wasteful Overheating No Noise—No Odors

Adsco Heating saves fuel because the Adsco Graduated Valve on each radiator makes overheating unnecessary. Use any portion of the radiator—just a thin layer of steam along the inner top for mild weather. This perfect control saves 20% to 30% fuel cost.

Adsco Heating is quiet, free from odors because there are no radiator air vents. Adsco Heating has been successfully used in every type of building.

Change hot water systems to more economical Adsco Heating. Use any standard heating boiler.

Ask for Bulletin No. 158-H which describes Adsco Heating for individual buildings. Bulletin No. 20-H describes Adsco Community Heating of a group of buildings from Central Station Steam Plant. Architects, engineers and heating dealers should also ask for Bulletin No. 159-H.

Higley Bldg., Cedar Rapids, Ia. Adsco Heating from Central Station.

Adsco Graduated Radiator Valve gives positive control of steam.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

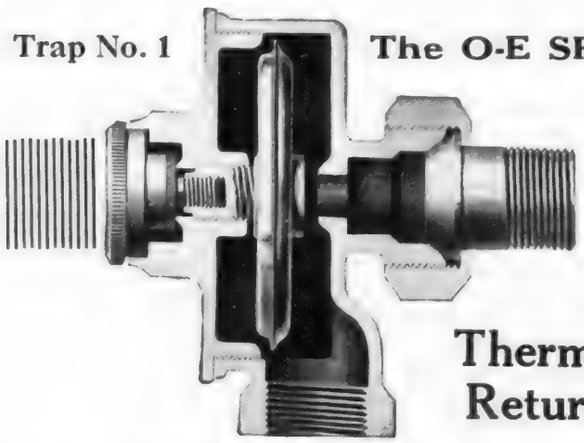
Offices:

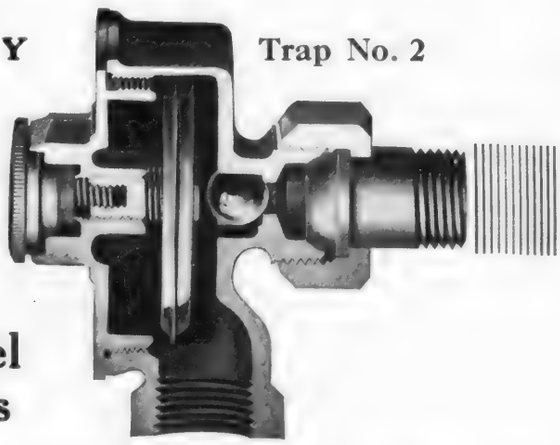
First Natl. Bank Bldg. Chicago | **1544 Woolworth Bldg. New York** | **Hoge Bldg. Seattle**

332 Endicott Bldg. St. Paul | **601 Columbia Natl. Bank Bldg. Pittsburg**

ADSCO HEATING

Trap No. 1 **The O-E SPECIALTY** Trap No. 2





Thermo-Nickel Return Traps

When You Get to Know Them Better

You Will Write "O-E THERMO-NICKEL" in Your Specifications

The O-E Thermo-Nickel Return Trap No. 1

With Its 12 Superior Points

1. The O-E diaphragm is manufactured of high-grade, cross-rolled, non-corrosive metal heavily corrugated, reinforced at point of heaviest duty, and is plated all over.
2. The thermostatic member closes against the steam, or vapor, and not in it, hence, it will not collapse from abnormal pressure, and since the trap is free of water at all times, there is no chance for it to freeze and become damaged.
3. The discharge of condensation from the trap is continuous and not intermittent, and does not depend on an accumulation of condensation to cool before it will open.
4. The flat disc closes against a semi-ball seat. Therefore, cannot stick or bind.
5. Can easily and quickly be adjusted from the outside, without removal from the radiator.
6. The vertical seat is practically self-cleaning and sediment or other foreign matter will not adhere as it will on a horizontal seat.
7. The body is manufactured of best Government bronze, and not of cast iron.
8. Highly polished top, and heavily nickel plated all over.
9. Locking device that prevents the thermostatic member getting out of adjustment. (A new trap feature.)
10. Each trap is tested by not less than 50 lbs. pressure, and properly adjusted. Requires no further attention.
11. Guaranteed to remain closed at about 212° Fahr. when vacuum pump on return line is pulling 10" of vacuum.
12. Costs no more than ordinary trap.

THE O-E Thermo-Nickel Return Trap with Non-Corrosive Ball Check is just what the heating Engineers, Architects and Contractors have been looking for and the trap is destined to make for itself many good friends. And like good friends, the better it is known the better it will be liked.

Trap No. 2 is practically the same in construction as Trap No.1 —a high-grade combination thermostatic return trap with the ball check feature.

How It Operates

The Non-Corrosive Ball-Check

The non-corrosive ball-check operates on a smooth guide or track, and is rolled to its seat against vapor or steam by the expansion of gas in the thermal member. When the radiator supply valves are closed, condensation of the steam forms a vacuum in the radiators which holds the balls to their seats, permitting all water in the return lines to flow freely back to the boiler, thereby eliminating the danger of broken boiler sections and preventing steam or vapor short-circuiting into radiators through return risers.

(Numerous heating boilers have been damaged on account of the vacuum, formed by condensation in the radiators when the supply valves are closed, holding water in the return lines, preventing its return to the boiler.)

When supply valves are opened, the balls are released from their seats permitting air and condensation to freely enter the return lines, without pressure.

Exhaustive tests have demonstrated that O-E Thermo-Nickel Traps will hold tight on a vacuum pump installation, as well as on a vapor or pressure job and that the non-corrosive balls, in the traps with checks, **will not "chatter."** (See Test Bulletin No. 530.)

The O-E Combination Ball-Check Trap is the only trap made with the check feature, and it costs no more than an ordinary return trap. Engineers and Architects will specify "O-E" No. 2 as insurance against boiler damage, this insurance alone being worth more than the reasonable price asked.

O-E SPECIALTY MANUFACTURING CO.

Manufacturers of the

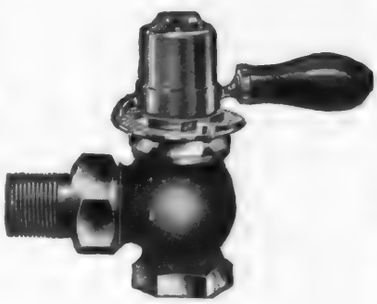
Celebrated "O-E" Vapor-Vacuum-Pressure "3-in-1" Heating Specialties

Milwaukee, Wisconsin U. S. A.

Dole

For Highest Radiator Efficiency

THE efficiency of a steam heating system is measured by the efficiency of the radiator valves. Leaky radiator valves are a common cause of trouble and damage.



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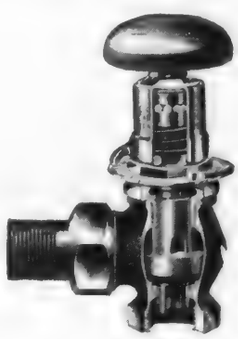

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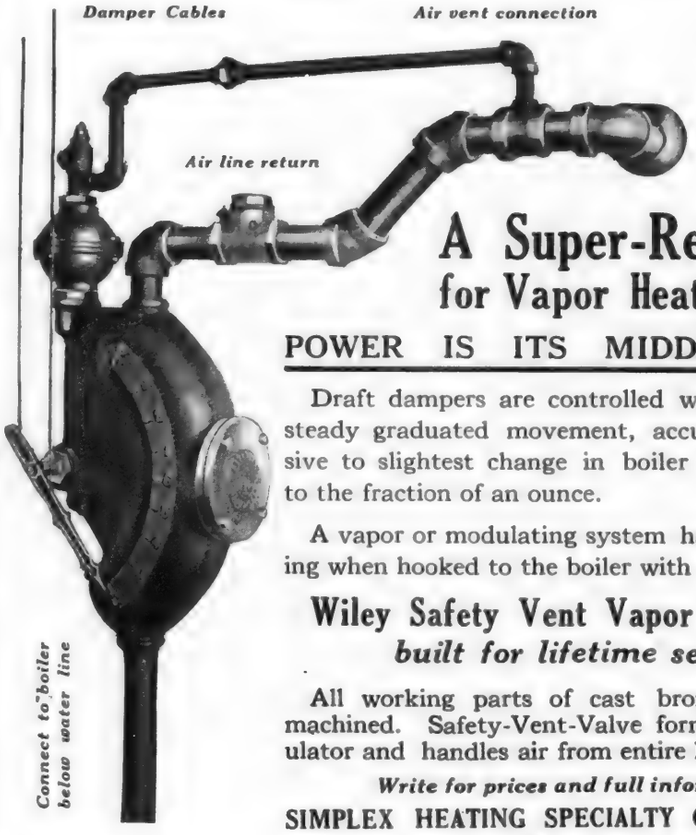

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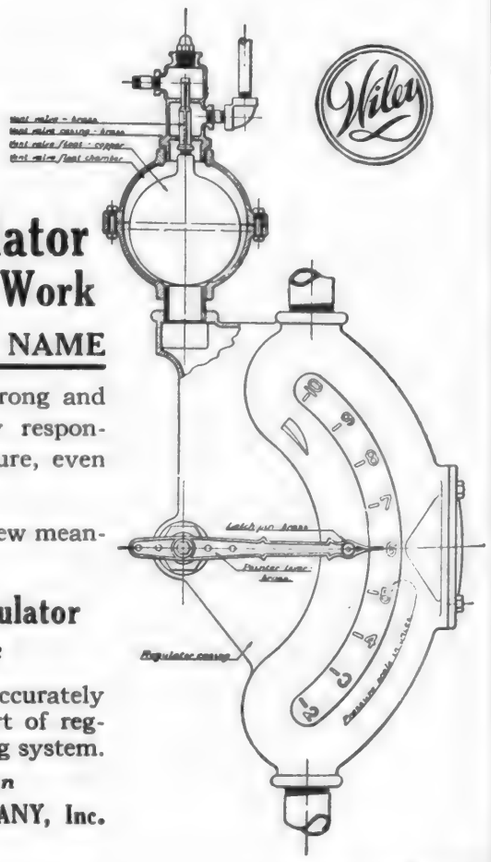

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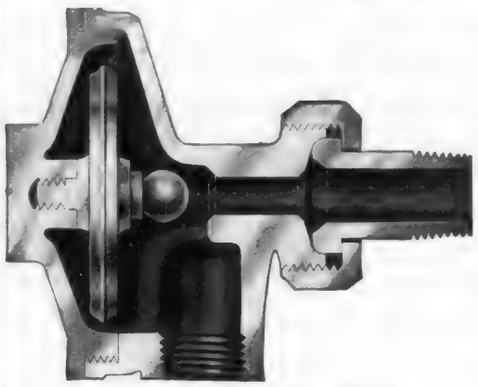

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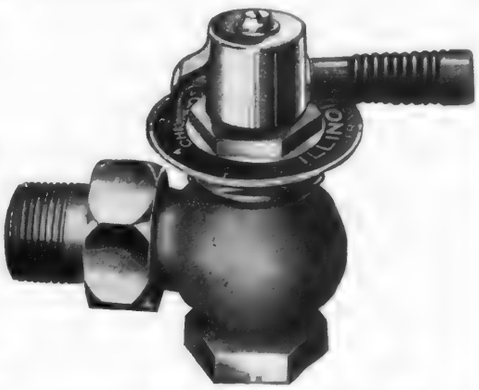

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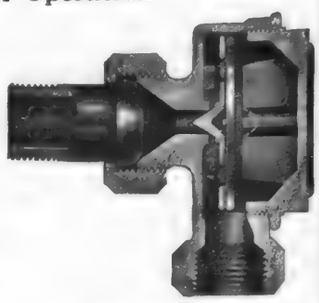

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The Heating and Ventilating Magazine

VOL. XIX. NO. 7

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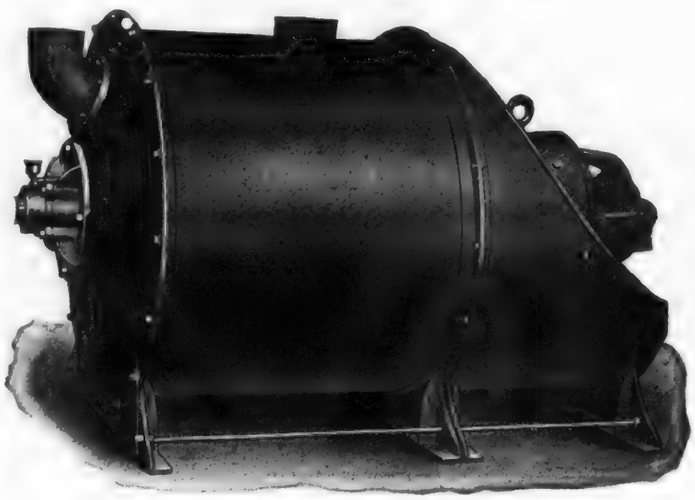

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JULY, 1922

RECENT DATA ON EXHAUST STEAM FOR HEATING

Records of Operation in Office Buildings and Hotels in New York City Made the Basis of New Coal Consumption Charts

EDITOR'S NOTE.—*The accompanying data constitute the report of the Heating Research Committee of the National District Heating Association, as presented at its recent meeting at Cedar Point, O., June 20-23. The curves are compiled from information received in response to a questionnaire sent out by the committee. The data obtained cover six buildings in New York City. Additional curves are included based upon the building heating data which appear in the association's new Handbook.*

THE extent to which the exhaust steam available from a building steam-electric generating plant can be utilized for heating purposes depends upon a number of factors, of which the principal ones are as follows:

1. The total amount of exhaust steam available per year.
2. The total amount of steam required for heating.
3. The duration of the heating season and the monthly distribution of exhaust steam available during this period.
4. The monthly distribution of the steam required for heating.
5. The hourly distribution of available exhaust steam as compared with the heating requirements.

In undertaking a study of this question, it must be recognized at the start that the differing conditions found in buildings will produce an infinite variety of results, each case requiring individual analysis. However, it is possible to develop data based upon results in a number of different buildings, which might have real value in calculating upon other buildings.

ACTUAL RESULTS IN LARGE OFFICE BUILDINGS

Fig. 1 shows the pounds of steam used per day in heating a large office building (volume 6,500,000 cu. ft.) in New York City, as compared with the corresponding daily differences in degrees between the mean outside temperature and 70°F. These observations, covering a period of four months, show that, allowing for some inaccuracies in the integration of steam charts, differences between day and night temperatures and wind conditions, this degree difference will serve as a very fair basis for determining the variations in heating requirements.

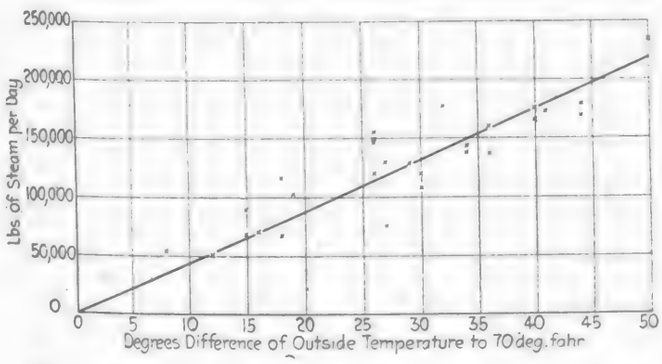


FIG. 1—EFFECT OF OUTSIDE TEMPERATURE UPON HEATING REQUIREMENTS.

The curve, Fig. 2, shows the degree days difference between normal outside temperature and 70°F. for the heating season as applied to New York City. Assuming that the heating requirements follow this variation, this curve indicates the percentage of the total steam for heating which will be required during each month of the heating season. This question of variation of the heating requirements could, of course, be carried further to show the daily and hourly maximum and minimum demands, but this is not deemed desirable. It is doubtful if the accuracy of the conclusions as a basis for calculation would be increased by such refinement.

Having estimated the total heating requirements for a building, it is possible from the curve below to estimate, with reasonable accuracy, the portion required during each month of the heating season, for an average day in each month of the heat-

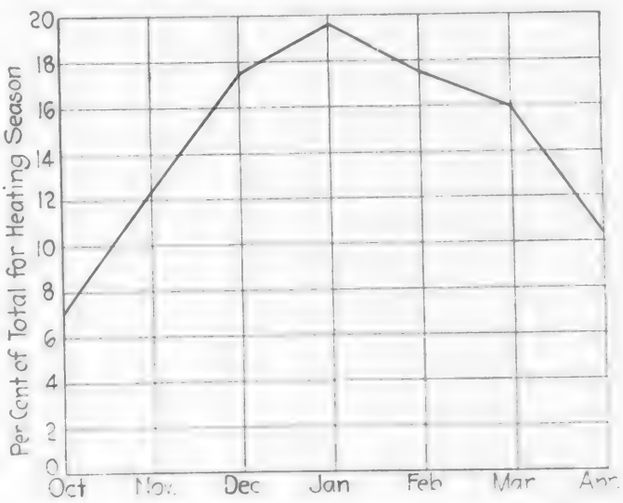


FIG. 2—THEORETICAL VARIATION OF HEATING REQUIREMENTS.

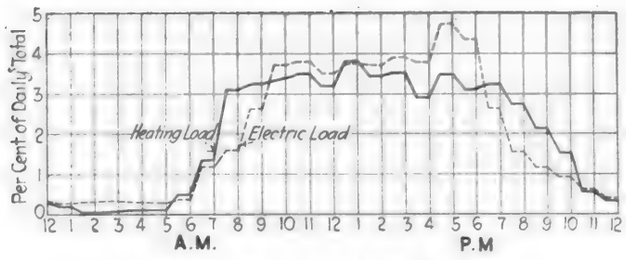


FIG. 3—OFFICE BUILDING NO. 1.

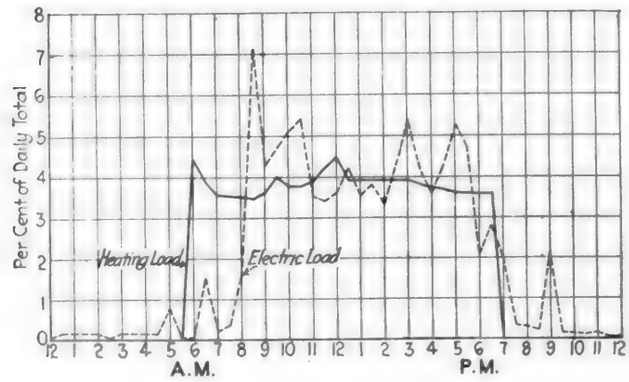


FIG. 4—OFFICE BUILDING NO. 2.

ing season. It then becomes necessary to ascertain how this average daily demand varies from hour to hour, and how this hourly demand compares with the corresponding variation in the exhaust steam available.

For this purpose, hourly records of steam used for heating and also electric load have been secured at four office buildings and two hotels in New York City. These observations, taken in January, were continued over a number of days in order to obtain results which might be considered typical, and the hourly quantities were reduced to terms of percentages of the daily total, for ready application to any case.

Fig. 3 shows the results for an office building twenty-four stories high, with a volume of 6,500,000 cu. ft., not on a corner, but extending through from one street to another.

The building referred to in Fig. 4 is thirteen stories high, situated in the centre of a block, with a gross volume of 577,000 cu. ft.

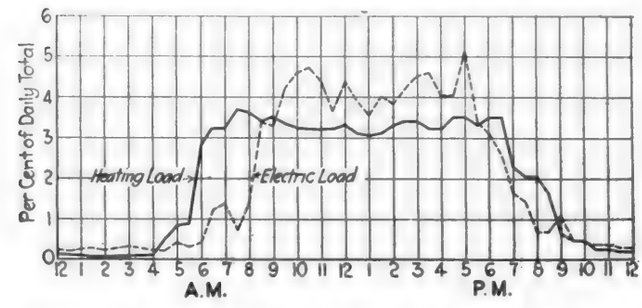


FIG. 7—COMPOSITE VARIATION OF HEATING AND ELECTRIC DEMANDS IN FOUR OFFICE BUILDINGS.

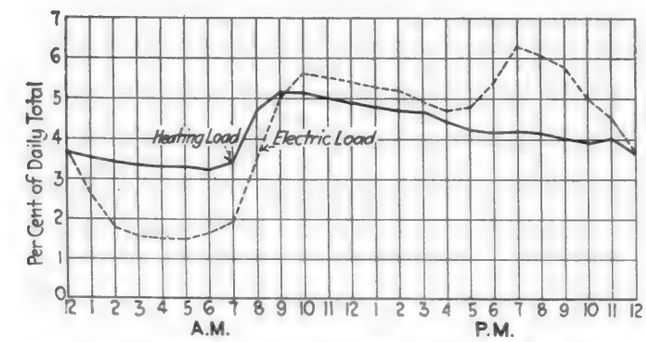


FIG. 8—VARIATION OF HEATING AND ELECTRIC DEMANDS IN HOTEL NO. 1.

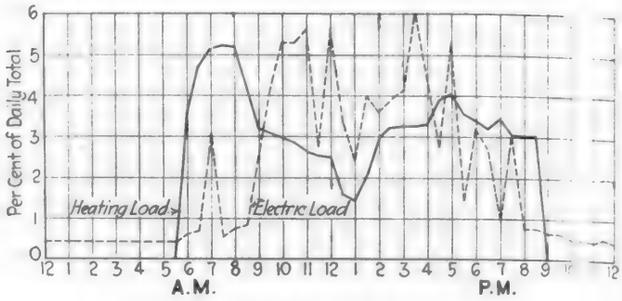


FIG. 5—OFFICE BUILDING NO. 3.

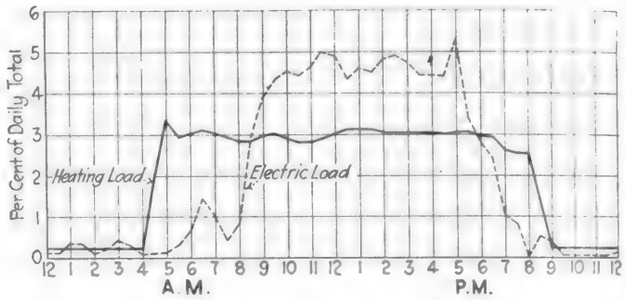


FIG. 6—OFFICE BUILDING NO. 4.

Fig. 5 shows the results in an eighteen story building, on a corner, with a gross volume of a little less than 1,000,000 cu. ft.

Fig. 6 refers to a seven story building in the middle of a block with a volume of 1,727,000 cu. ft.

All of the above buildings are typical office buildings in New York City, with electric elevators, using steam for heating and a small amount for hot water. In order to iron out probable inaccuracies and at the same time to provide a conclusion more general and therefore of possibly greater usefulness, the percentages as found in these four buildings have been combined and presented as composite curves in Fig. 7.

RESULTS OBTAINED FROM TWO HOTEL BUILDINGS

Figs. 8 and 9 show similar results obtained from two hotel buildings. The first is of the apartment type, with a volume of

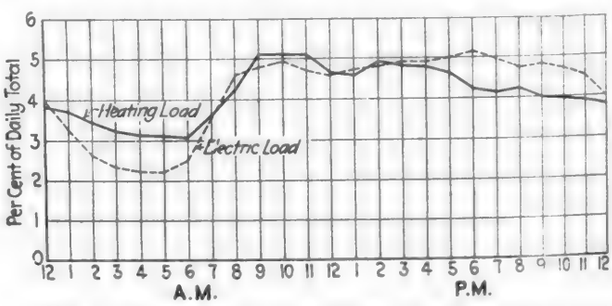


FIG. 9—VARIATION OF HEATING AND ELECTRIC DEMANDS IN HOTEL NO. 2.

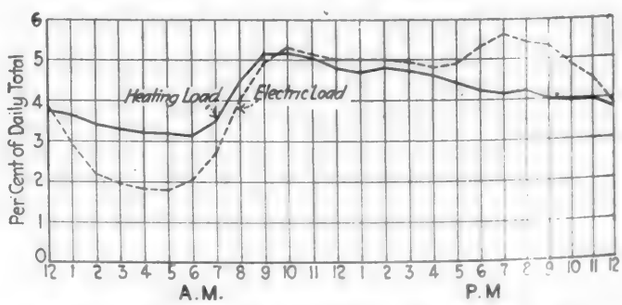


FIG. 10—COMPOSITE VARIATION OF HEATING AND ELECTRIC DEMANDS IN TWO HOTELS

2,000,000 cu. ft., and the other a modern transient hotel of over 12,000,000 cu. ft. Both of these buildings are situated on corners, the larger one occupying an entire block front. Fig. 10 shows composites of these two cases.

FIGURING A HYPOTHETICAL CASE.

For the purpose of illustrating the use of data such as the above in obtaining a rough approximation of the extent to which exhaust steam would be utilized, let us consider a hypothetical case. Assume an office building for which the steam consumption for heating has been estimated at 20,000,000 lbs., and with an electrical consumption during the heating season of 6,000,000 K. W. H. The water rate of the electric generating units is such that the exhaust steam available, after deducting losses in the live and exhaust steam piping and in the apparatus, is 40 lbs. per K. W. H. generated.

The average daily steam for heating, covering the entire heating season, is about 100,000 lbs, while the average amount of exhaust steam available per day is 120,000 lbs. Applying the hourly variations in heating and electric loads as shown by Fig. 7, the average daily relation of the steam demand and supply during the heating season is shown by Fig. 11. The shaded areas of this chart represent the pounds of exhaust steam utilized, and show that under average conditions this amounts to 86,000 lbs. per day. This is 71% of the total amount of exhaust available and 86% of the total heating requirements.

The above application is naturally general and approximate. It is very probable that greater accuracy would result if an average day were considered for each month rather than for the heating season as a whole, but it is doubtful if further refinement would be worth while.

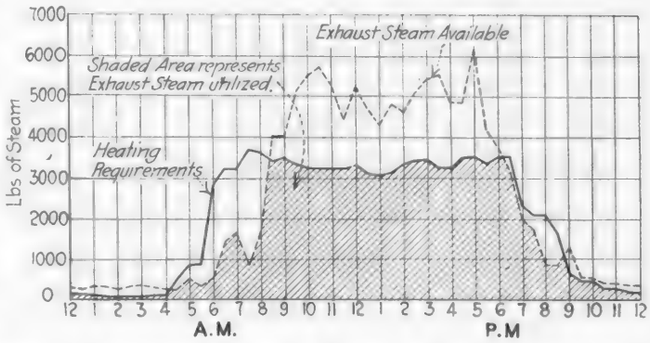
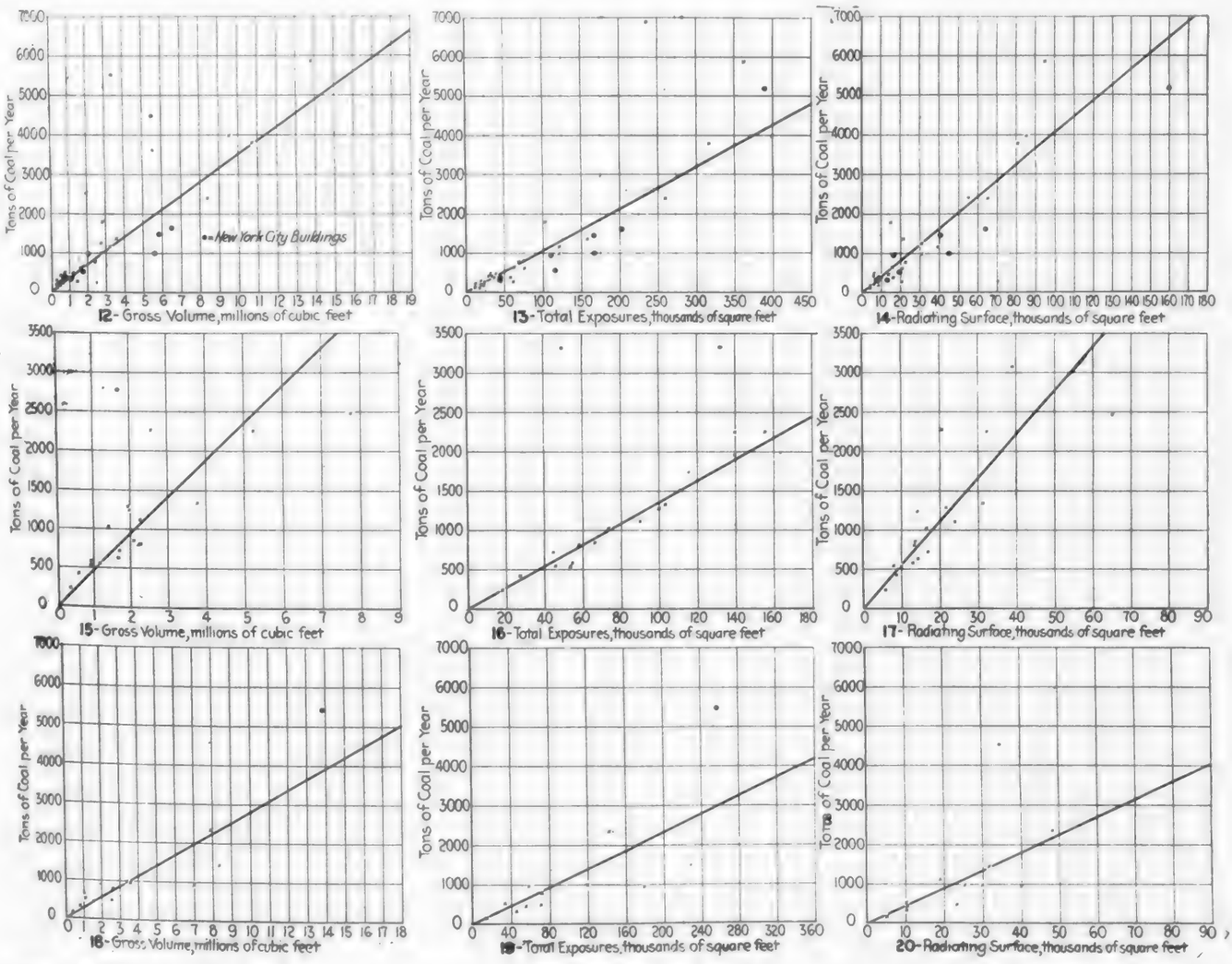


FIG 11—UTILIZATION OF EXHAUST STEAM HYPOTHETICAL CASE.

(Note that curves are based on "percentage of demands" basis, rather than on "pounds of steam per kilowatt hour.")

ADDITIONAL CURVES BASED ON HEATING BUILDING DATA IN ASSOCIATION'S HANDBOOK.

To the members of the National District Heating Association there is no need to emphasize the necessity of accurate data for use in estimating the heating requirements of buildings. The figures published in the Hand Book represent a great accomplishment in this direction and should prove of great value in checking the accuracy of various existing formulae, and perhaps in deriving new methods for estimating heating requirements.


Tons of Coal per Year
New York City Buildings
12- Gross Volume, millions of cubic feet
13- Total Exposures, thousands of square feet
14- Radiating Surface, thousands of square feet
15- Gross Volume, millions of cubic feet
16- Total Exposures, thousands of square feet
17- Radiating Surface, thousands of square feet
18- Gross Volume, millions of cubic feet
19- Total Exposures, thousands of square feet
20- Radiating Surface, thousands of square feet

COAL REQUIRED FOR HEATING OFFICE BUILDINGS (FIGS. 12-14), HOTELS AND CLUBS (FIGS. 15-17) AND DEPARTMENT STORES (FIGS. 18-20).

There are a number of formulae in general use for determining probable heating requirements, some of which are quite complicated, including consideration of wall material and thickness, window trim, windage, etc. In many cases the information available is not sufficiently complete to apply these complicated formulae; and again, a more or less approximate estimate is frequently satisfactory for the purpose.

For these reasons, it is believed that a consolidation of the Hand Book building heating data in a form adapted for quick reference should be of interest and value in cases where, for one reason or another, it is either not practicable or unncessary to go into refinements for high accuracy.

Study of the results in many large buildings leads to the conclusion that the amount of steam used for heating varies roughly with (1) the volume, (2) the total exposed surface, and (3) the radiator surface. It is possible to secure at least one of these quantities in any projected case, and frequently all three, and with comparatively little effort or loss of time. It was therefore decided to compare the actual figures available upon these three bases, and to prepare a set of such curves for an office building (Figs. 12-14); hotels (Figs. 15-17); and department stores (Figs. 18-20).

In view of the number of variable quantities affecting the heating requirements, but not taken into account in these curves, the fairly close agreement is rather surprising. The charts are presented for what they may be worth.

MECHANICAL EQUIPMENT OF THE INTERMEDIATE OR JUNIOR HIGH SCHOOL IN DETROIT

Details of the "Projection" Method of Air Distribution, with Ceiling Fresh Air Outlets, as Adopted in the Barbour Schools

BY H. W. ANDERSON.

Assistant Director of Educational Research, Board of Education, Detroit, Mich.

From a paper presented at the semi-annual meeting of the American Society of Heating and Ventilating Engineers, in Detroit, Mich., June 8, 1922.

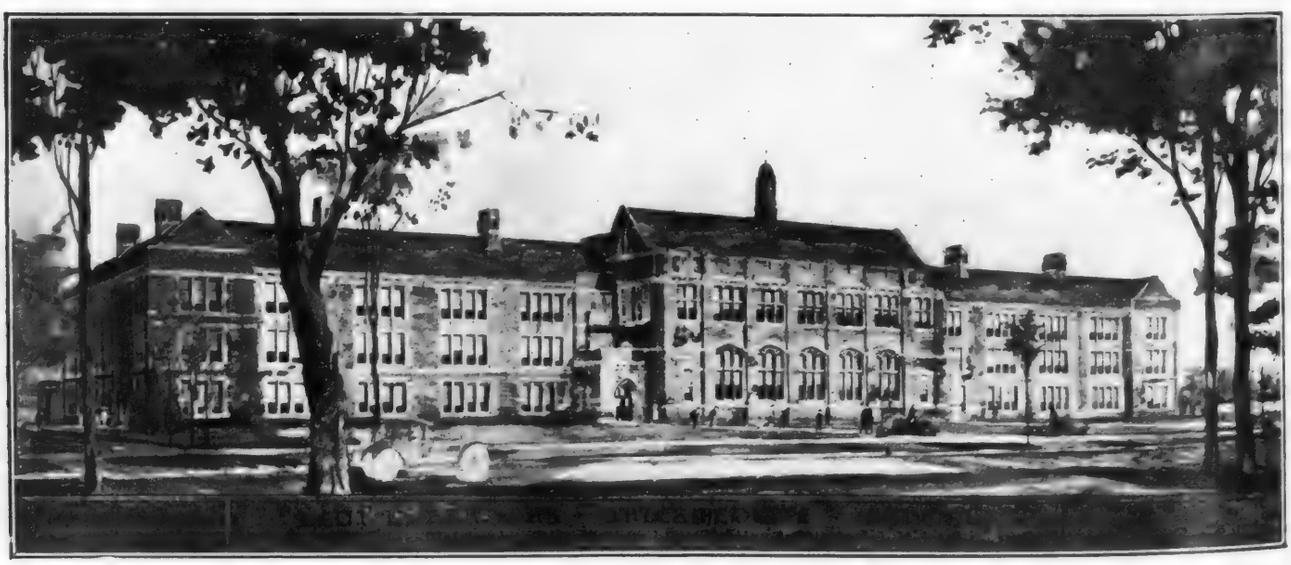
ABOUT three years ago Deputy Superintendent Charles L. Spain and Assistant Superintendent P. C. Packer, under the administration of Superintendent Frank Cody, began the movement in Detroit to furnish the architect with educational specifications for schools. In planning the intermediate school, of which the Barbour and Hutchins are our best examples, extensive investigations were carried on to determine the best type of organization, the subjects pupils selected, and finally the probable program of the new school.

As far as we know the best modern thought has been utilized in providing for the health of the student. Classrooms are located on both sides of the corridor. Lighting is unilateral, with the exception of some of the corner rooms which are intended for open air class rooms. There are no wardrobes, pupils' coats and hats being taken care of in built-in corridor lockers. Toilets are conveniently located on each floor. Proper heating and ventilating mechanisms have been provided to insure healthful air.

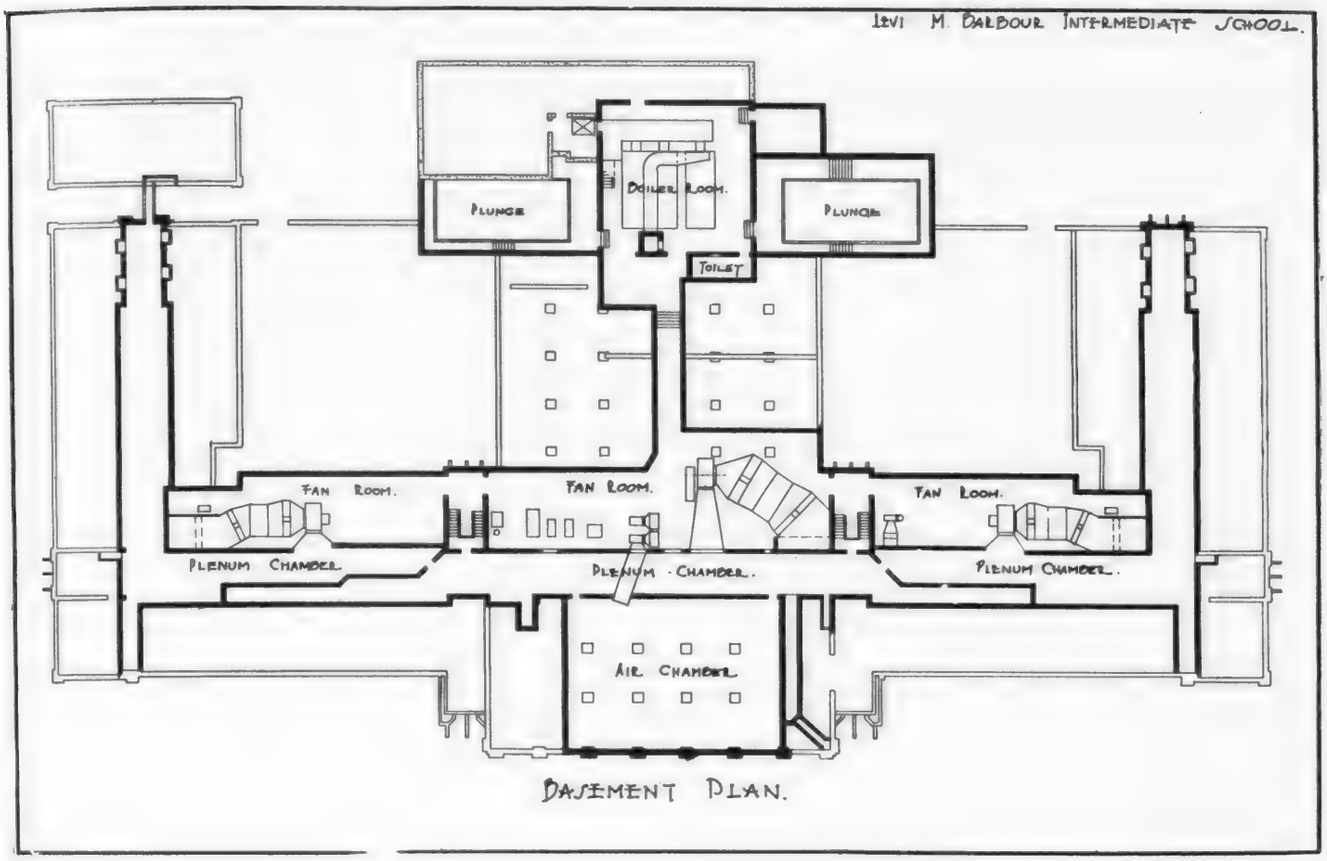
HEALTH TRAINING FACILITIES.

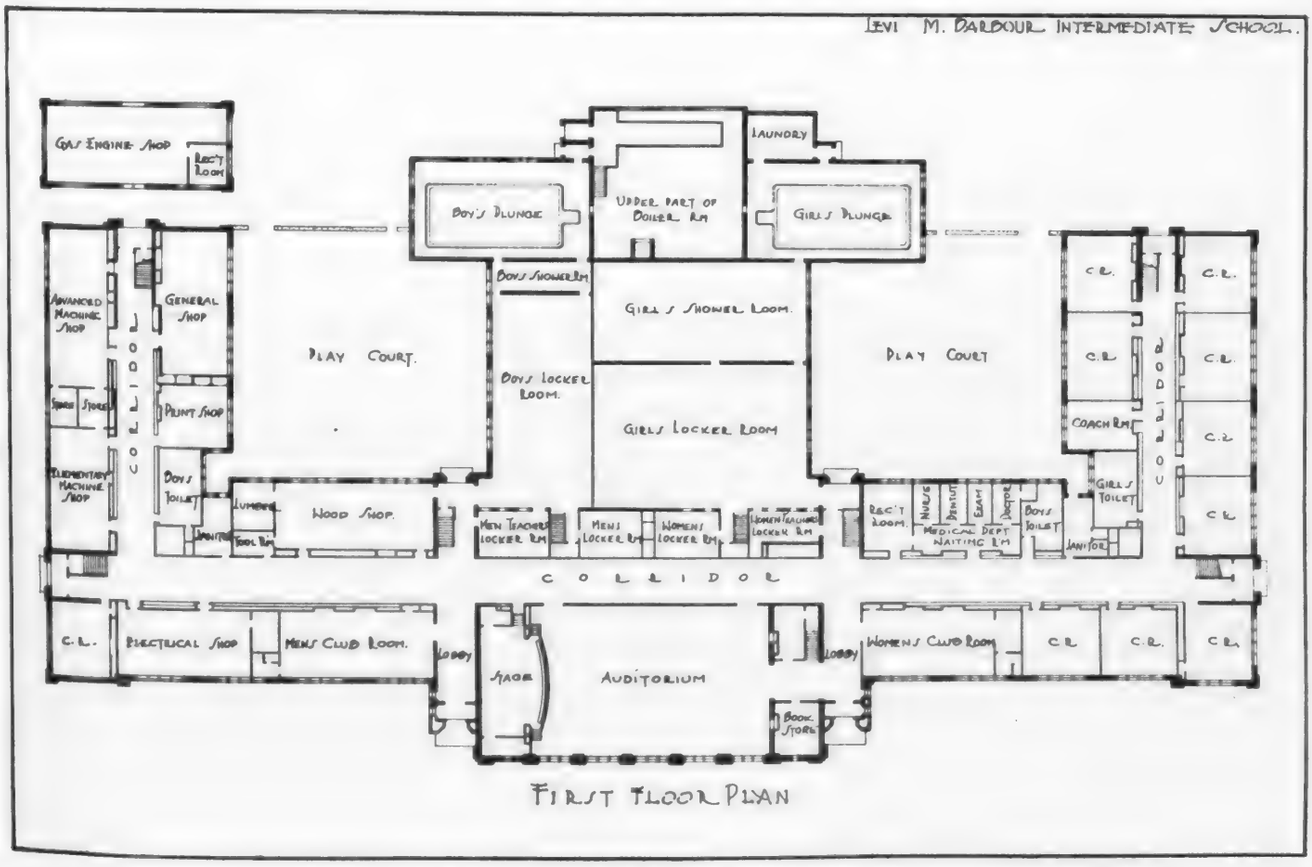
The health training facilities consist of two gymnasiums, two covered playcourts, two swimming pools, shower baths and a medical suite.

Every one of the 1,800 boys and girls take an hour daily for exercise and shower bath. The floor plans show the location of the health department in the center of the building where it is easily accessible from all parts. This section of the building with the auditorium may be heated and lighted independently of the rest of the building. This provision enables the economic use of these facilities by the people of the community after school hours.



Malcomson, Higginbotham & Palmer, Architects.
THE LIVI M. BARBOUR INTERMEDIATE OF JUNIOR HIGH SCHOOL, DETROIT, MICH.





FLOOR PLANS OF THE LEVI M. BARBOUR INTERMEDIATE SCHOOL

VOCATIONAL TRAINING.

The school program provides for vocational training. Since Detroit is a manufacturing city, the boys select very strongly the mechanical arts courses. For this purpose one floor of one end of the building is devoted almost exclusively to shops. Seven shops have been provided and will be used all the time by the boys of the school. (See floor plans.)

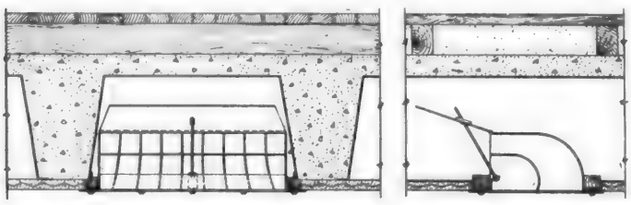
The girls' vocational work is in the home making courses. Three cooking rooms are located on the third floor adjacent to the lunch rooms. Three sewing and millinery rooms have been located on the second floor near the rooms for art, in which designs for hats, dresses, etc., may be prepared before actually made by the students.

Commercial work also constitutes an important phase of the school program. Two special rooms have been provided for bookkeeping and one for typewriting.

This entire program was carefully worked out and estimates of the number of pupils who would take each course were prepared before any steps were taken to plan the building. These studies formed the scientific bases for determining the number of classrooms, shops, laboratories, etc.

The heating and ventilating equipment used in the new intermediate schools represent the latest standards for all new Detroit schools.

For several years, prior to the building of these schools, the consulting engineers for the Detroit Board of Education had been using what might be called a modified "split" system, wherein sufficient direct radiation was supplied to take care of



DETAIL OF SPECIAL CEILING DIFFUSERS.

approximately 75% of the heating, and the air used in ventilation warmed sufficiently above room temperatures to supply the necessary additional heating effect. The temperature of the air delivered to each room was under individual thermostatic control, there being separate ducts from the fan to each room.

This system, by introducing air into the room considerably above room temperatures, utilized to a large degree the stratification of the air and its settling as it cooled for purposes of distribution.

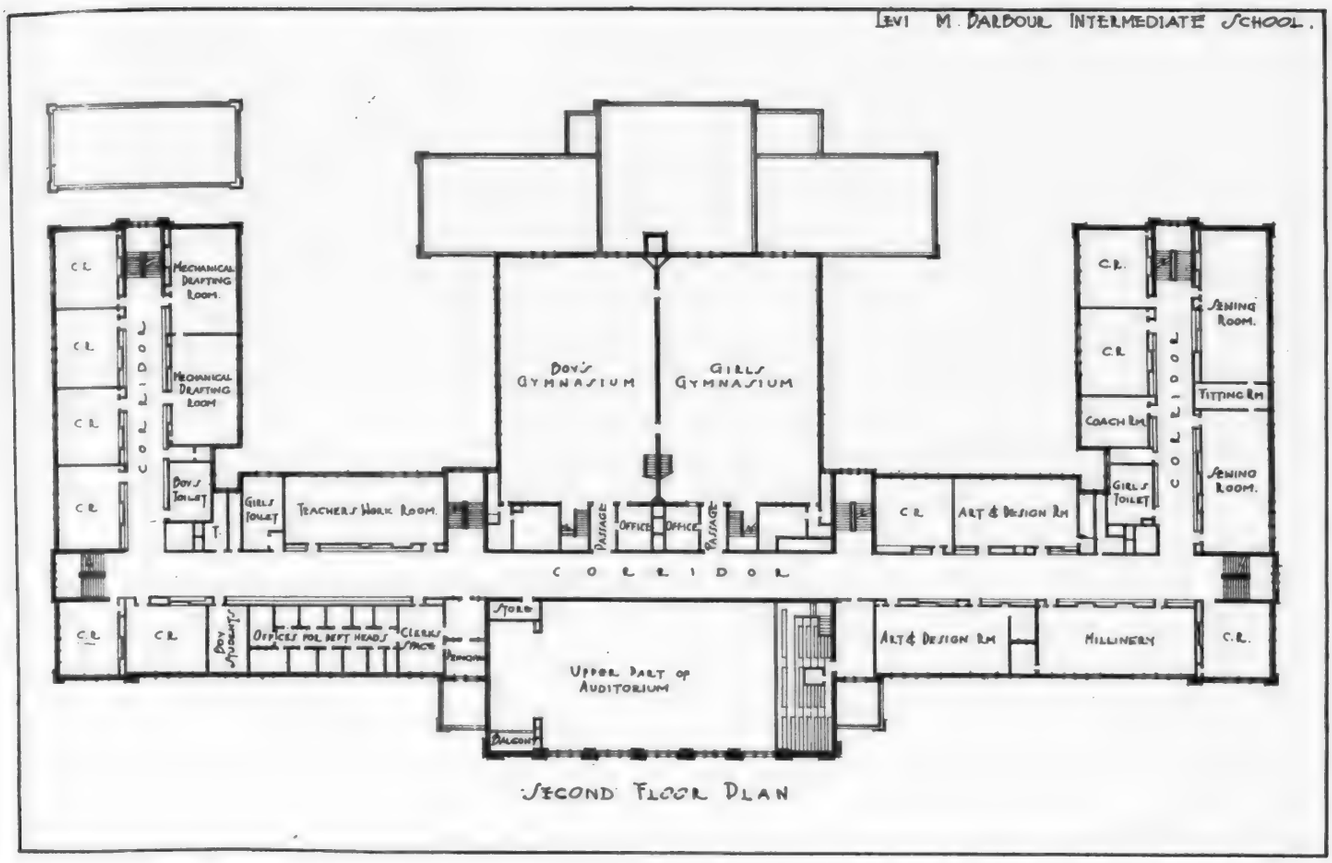
TYPICAL CLASSROOM INTERIOR, LEVI M. BARBOUR INTERMEDIATE SCHOOL.

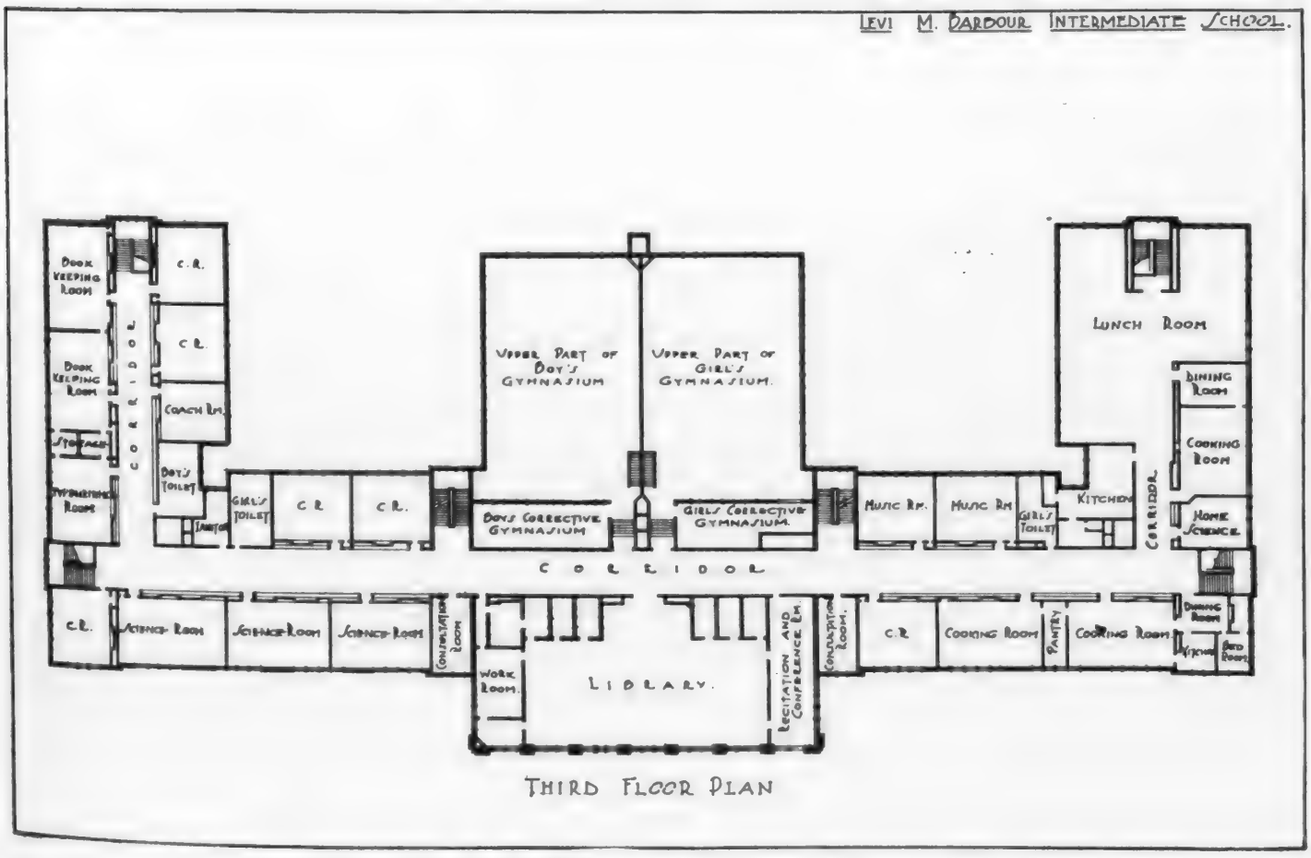
PROJECTION SYSTEM OF VENTILATION USED.

During the war period the cost of sheet metal duct work mounted so that it became necessary to design a system which would give at least equal results and which could be installed at lower first cost. With this problem to be solved, the consulting engineers of the Board of Education gave the matter intensive study and finally decided that a "projection" system, pure and simple, in which the air would be distributed by virtue of its velocity was the proper solution to work on. They had used ceiling outlets for air delivery many years ago and it was decided to come back to this system in a more refined way, provided the architects could help solve the question of installation of proper ducts in the fireproof buildings. The cooperation of the architects in using the steel pan type of concrete floor construction simplified the problem, making it possible to utilize the void spaces between the concrete floor joists for ducts, these being laid out for the proper location.

The system as worked out has proved very simple and cheap. This was partly made possible by the fact the Detroit Board of Education started to build schools without basements, Detroit being one of the last of the large cities to adopt this policy. It is therefore possible to utilize a basement corridor under the first floor corridor, as a large distributing plenum chamber for tempered air. This chamber is made of sufficient height for one to walk through and is equipped with hose connections and floor drains so that it can be easily washed down and kept sanitary. It also serves as a space for carrying steam and return lines, electric conduits, etc.

HAIR DRYER IN GIRLS' LOCKER ROOM, LEVI M. BARBOUR INTERMEDIATE SCHOOL.





FLOOR PLANS OF THE LEVI M. BARBOUR INTERMEDIATE SCHOOL.

The use of this large distributing plenum chamber has eliminated practically all the sheet metal work formerly used, there remaining simply the verticals to connect with the ceiling ducts.

OPERATING RESULTS.

The results obtained from Detroit's latest system with ceiling distribution of air have proved very satisfactory not only as to first cost, but in the efficiency and uniformity of air distribution. Although the systems are laid out for the old standard of 30 cu. ft. of fresh air per minute per pupil, it is expected, due to the uniformity of distribution, to cut this amount down at least to 20 cu. ft. of air per minute and possibly to 15. Furthermore, it is posible to recirculate any amount of the air, inasmuch as the fresh air is drawn from above the roof with a connection from the shaft to the attic, which, with pneumatically-controlled dampers, makes it possible to use all recirculated air or all fresh air or any desired percentage of each.

The fresh air supply for the building is taken in through three vertical shafts extending from the basement to a point above the main roof. Two supply fans with a capacity of 45,000 cu. ft. per minute each, and one with a capacity of 75,000 cu. ft. per minute deliver the air from these shafts to the basement air chamber, extending completely around the building. Each supply fan apparatus is equipped with tempering coils, air washer and reheater coils with automatic temperature and humidity controlling devices.

Vertical galvanized-iron risers conduct the air from the air tunnel to the various rooms. These risers are installed in the corridor walls and connect to short horizontal ducts in the floor construction or attic above the respective rooms. Two of these horizontal ducts are provided for each standard class room and in each duct are installed three special diffusers or a total of six per classroom, symmetrically arranged in the ceiling. Each classroom is provided with two vent openings for the egress of vitiated air, located at the floor on the corridor side, equipped with grilles or registers, and connections to vertical metal flues leading to the attic.

FLOOR SPACE OCCUPIED BY AIR FLUES REDUCED TO A MINIMUM.

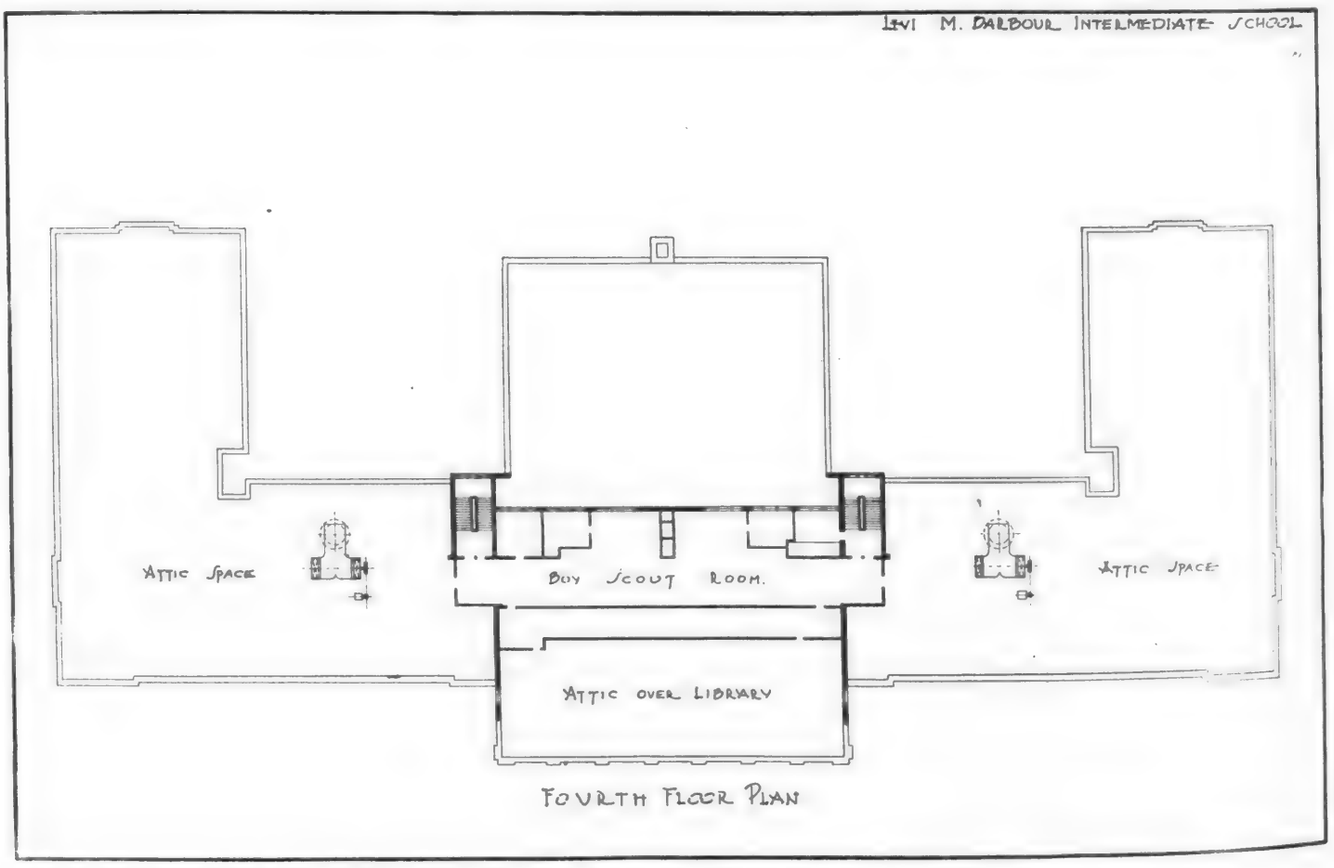
The vertical supply and vent flues in the furred corridor wall are so arranged with respect to the corridor wardrobe lockers, class room bookcases and closets that the floor space taken up by these flues is reduced to a minimum. The short horizontal ducts in the floor construction leading from the risers to the outlets in the various rooms are incorporated in the concrete construction, the duct occupying the space ordinarily taken up by one row of steel or terra cotta floor tile.

In the Barbour School removable steel tile forms were employed in the construction of the concrete floors and in this instance the void spaces formed by the removal of the steel tile were utilized as ducts, a single sheet of galvanized-iron and the usual ceiling lath and plaster forming the bottom of these air passages to which the diffusers are attached.

All vent flues from the various rooms open to the attic and as a supplement to the supply fans, two motor-driven exhaust fans of the propeller type are provided in the attic for exhausting the air from the attic through roof ventilators.

DETAILS OF CEILING DIFFUSERS.

The ceiling diffusers are set behind pressed metal grills flush with the plaster, and are equipped with two sets of diffusing vanes at right angles to each other, as shown in Fig. 3. This arrangement of vanes is designed to diffuse the air in the shape of a cone from the outlet to the floor of the room. The outlets in the ceiling are so spaced that these cones of air intermingle and overlap at the level of the breathing zone. Smoke tests made in rooms equipped with this system of ventilation showed conclusively that the air distribution is very uniform. Relatively low velocities at the outlets are employed in order to avoid uncomfortable drafts from the air supplied directly overhead.



FOURTH FLOOR PLAN, LEVI M. BARBOUR INTERMEDIATE SCHOOL.

Fig. 4 shows the typical arrangement of ceiling outlets and vent registers in the classrooms.

The auditorium, gymnasiums, swimming pools, locker rooms, shower rooms, club rooms, etc., are located in the center portion of the building. These rooms constitute that portion of the building used for community purposes and are ventilated by means of the larger supply fan and so arranged that both the heating and ventilating systems for this portion can be operated separately from the remainder of the building.

REVERSIBLE VENTILATING SYSTEM FOR AUDITORIUM.

The auditorium is provided with a reversible system of ventilation. During the cold weather the warm, fresh air supply is admitted through four large grilles located in the corners of the room. The vitiated air is drawn off through mushroom ventilators located in the floor under the seats by means of an exhaust fan, which delivers this air through roof ventilators. The space under the auditorium floor is finished off to form an air chamber, which can either be connected to the exhaust fan or to the supply fan by means of suitable transfer dampers.

During the warm weather cool air is admitted to this chamber from the supply fan and forced through the mushroom ventilators in the floor, the vented air leaving the auditorium through ornamental plaster grilles in the ceiling connected with vent flues leading to roof ventilators. The entire system of transfer dampers required to reverse this ventilating system is controlled pneumatically by means of diaphragm motors with operating switches located in the fan room. The air supply to the gymnasium is admitted through diffusers and grilles located immediately below the window sills and the vent openings for winter operation are located at the four corners of the room at the floor. During the warm weather, vent openings in the roof connected to the roof ventilators are used.

The fresh air supplied to the locker rooms is admitted through ceiling diffusers and a fan exhaust system is provided, together with a system of underground vitrified clay tile ducts, which exhausts the air from the room through the individual clothing lockers, serving the double purpose of ventilating the room and the lockers. This arrangement has proved very satisfactory as a method for preventing the odors from lockers contaminating the air in the rooms.

NOVEL HAIR DRYING EQUIPMENT.

A special feature of the girls' locker room is a new type of hair drying equipment. Due to the relatively large number of girl students using the shower rooms daily, it was necessary to provide some means for the rapid drying of the hair. This apparatus is constructed of sheet metal, suitably reinforced, and is equipped with twenty-four adjustable funnel shaped outlets, the whole being finished in hard white enamel. The outlets can be readily turned to any desired angle to accommodate students standing or sitting and are so designed that when turned to the extreme lower position, the air supply is automatically cut off from the outlet. The hair dryer is supplied by a small fan located in the fan room below the locker rooms, drawing washed air from the plenum chamber through heater coils under thermostatic control. The motor driving this fan is equipped with an automatic starter and is operated by means of suitable push buttons located in the locker room adjacent to the hair drying apparatus. This equipment will accommodate approximately 100 pupils per hour.

All toilet rooms are ventilated by means of an exhaust system, the two fans used for this purpose being located in the basement fan rooms, delivering the air through roof ventilators. The kitchen, caféteria, chemical laboratories and domestic science rooms are equipped with separate exhaust systems, similar to that provided for the toilet rooms.

The direct radiation in general is located around the exterior walls beneath the windows. All radiators are equipped with metal shields to protect the pupils seated nearest the radiators from the radiant heat. All temperature regulation is accomplished by controlling the direct radiation, the temperature of air supplied to the rooms being maintained constant at approximately room temperature. Diaphragm motors are used for controlling all dampers in connection with the ventilating system. These are operated by means of pneumatic switches placed in the fan rooms and the air supplied by the same is taken from the compressed air system provided in connection with the temperature regulation equipment.

BOILER ROOM.

The boiler plant is located at the rear of the building with a floor level approximately 10 ft. below grade. The fuel room is at the same level and the coal is admitted directly from the trucks through manholes into the fuel storage. A 1,000 lb. capacity electric platform hoist is provided for elevating the coal in charging barrows from the coal room level to the firing platform, which is approximately 10 ft. above the boiler room floor. This hoist is also used to elevate the ashes from the boiler room floor level to grade. Three 150 H. P. return tubular boilers with dutch oven settings and natural draft automatic stokers are installed for providing steam to the plant. The firing is automatic, the coal being dumped directly from the elevated firing platform to the tops of the dutch oven furnaces of the stokers.

The large main supply fans are driven by low-pressure engines and exhaust through oil separators into the heating system. The boiler plant is designed to operate at approximately 40 lbs. pressure and this pressure is used for operating the fan engines. The fan coils and direct heating system are operated at low pressure by means of pressure regulating valves.

Steam Trap Losses.

The loss of steam through open pet cocks of steam traps or through leaky traps is extremely large and is generally due to parts of the trap binding or sticking, worn valves or seats, improper adjustments, defective or worn-out expanding members, etc. Traps with large surfaces are frequently left uninsulated, and allow a considerable waste, due to radiation. This waste can be prevented by the application of suitable insulation and by selecting traps whose surfaces are small compared to their capacity.

Traps and their parts should be frequently and carefully inspected and pet cocks kept closed as much as possible, and wherever possible, plugs should be substituted for pet cocks. This will eliminate much of the waste due to careless opening of pet cocks and failure to close them. By-passes also account for large waste, as they are frequently left open.

Waste due to discharge of steam, along with the water which it is the trap's function to discharge, should be eliminated. Inspections should be made by disconnecting the outlet pipes from traps and testing to discover and determine the amount of steam-leakage. A simple test can be made as follows:

Connect a pipe nipple, elbow and another nipple pointing down-ward to the outlet of the steam trap to be tested so that a pail of water can be placed under the nipple and so the trap will discharge through the pipe and under the surface of the water in the pail. By recording the weight and temperature of the water in the pail before and after trap has discharged into it, the exact amount of heat and water discharged from the trap may be measured. Checking these amounts with the "heat of the liquid" from steam tables it is easy to determine whether or not all the heat discharged was in the water or if an excess was carried out in steam that leaked from the trap.

Pail and water should be left under the discharge until the temperature of the water in the pail is as much greater than the temperature of surrounding air, as the temperature of the water below the temperature of surrounding air at start of test. This eliminates correcting for heat absorbed from air and heat radiated from water in pail during test.

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ALMOST every convention of business and professional men has its keynote and this year's gatherings of the representative men in the heating and ventilating industry proved no exception to the rule. At the meeting of the heating contractors in Buffalo the reports of busy times had a particularly appropriate setting in that Buffalo just now is in the midst of a clear-cut building boom. When the heating engineers met there the following week, while the arrival of better times was clearly indicated, it was equally clear that the class of building work which is now setting the pace does not require, for the most part, the same degree of engineering talent as the construction figures would indicate and for that reason the heating engineers have not yet become as active as they will be when the larger operations are in full swing.

Finally, the meeting of the central station heating men left no doubt that the district heating industry has taken on a new lease of life and that it is to-day on a splendid basis for a prosperous career. The outstanding cause of this condition is the attitude of the public utility commissions generally which have realized the need of more adequate heating rates and have, as a rule, granted satisfactory increases. At the same time the operating costs have receded to the point where the differential is once more making the business an attractive proposition. The only fly in the ointment is the anticipated attitude of the consumer who may be expected to agitate the lowering of rates as a consequence of lower costs. Here, it is generally agreed, lies the district heating man's opportunity, because if he, on his part, can help the consumer to practise even some of the simpler economies in the use of his heating service, it will easily be possible for the consumer to reduce his bills to a point where the total, even at the advanced rates, will not be unreasonable. This idea of co-operating with a view of reducing rather than jacking up the heating bills, was perhaps strange doctrine to some, but its advantages were so clearly presented and the importance of satisfying the consumer so plainly demonstrated as to give the policy a place of major importance in the immediate future of the central heating industry.

WITH the graduation from the technical schools of the country of another crop of young engineers, the question of how fully the present system of college training is fitting these men for their life work again comes to the fore. As everyone in commercial life knows, there is an hiatus between the training of the college and that required in commercial life; how to bridge this gap is the question that is agitating the educational world as never before. One method of solving the problem, which was given special prominence at a recent gathering of eminent industrialists and college executives, is to so shape the technical student's training as to turn him out a full-fledged commercial engineer. It is high time that the advocates of this plan should know what the practical men in the industry think of it and their views have never been more fully or more accurately expressed than in the address, at the recent meeting of the National District Heating Association, of Dean F. Paul Anderson, director of the Research Laboratory of the American Society of Heating and Ventilating Engineers, who also qualifies as an educator through his position as dean of the College of Engineering of the University of Kentucky. There was no dissenting note, for instance, to his statement that "getting young men ready for careers of dependability and usefulness in the industries involves two very necessary training schools—one the college, the other the industry itself. It is utter folly for the technical school to project its work with the idea that from its halls young men are to be sent out who will at once shape the policies of old and well-established industries. The failure of the college to show the youth exactly where he stands the day he is given his bachelor's degree is one of the weaknesses of our present educational system. The graduate from a technical course of study is in no sense an engineer when he receives his certificate of having completed a certain curriculum—he is just then ready to begin to learn something relative to commercial engineering by entering a high-grade industry, obeying orders and being always in the attitude to learn some of those thousands of important processes and traditions that college cannot give him at all. . . . Let the colleges lay the foundation; let the industries build the superstructure of preparedness for commercial engineering leadership."

There was more than mere humor in his sally that "newly-married folks and college graduates are hard to camouflage," and he gave the young graduate some plain truths to ponder when he said that "many of the most outstanding men in industry to-day have never had the privilege of college training."

National District Heating Association

Improved Situation in Central Heating Field Reflected at the Association's Thirteenth Annual Convention in Cedar Point, O., June 20-23

MORE adequate heating rates and lower operating costs made a combination hard to beat as a keynote for the thirteenth annual convention of the National District Heating Association, held at Cedar Point, O., June 20-23.

The improved situation was reflected in the attitude of both members and guests, and made the convention notable for that indefinable something which we call "pep." Everyone felt that the situation in the central heating field was getting back to a sound basis and that the immediate future of the industry was full of promise.

At the same time, a needed note of warning was sounded in the statement made more than once that a direct responsibility rests upon the utility companies to see that the consumer gets the full benefit of the service and does not needlessly waste his heat. Only in this way, it was argued, could the heating companies hope to retain their present rates. The consumer must be shown that his heating bills depend, to a large extent, upon his regulation of the service, rather than upon the rates in effect.

Several advances in the development of district heating were reported, notably the plant interconnection scheme as worked out by the Illinois Maintenance Company of Chicago.

Finally, the "round table" of new apparatus and appliances at which the manufacturers were given the floor to demonstrate their latest products, proved a successful innovation, and will no doubt be repeated at future conventions.

EDWARD L. WILDER, ROCHESTER, N. Y.
New President of the National District Heating Association.

Opening Session, June 20.

Promptly at the hour scheduled Tuesday morning, President J. H. Walker opened the meeting in the convention hall of the Breakers' Hotel.

PRESIDENT'S ADDRESS.

President Walker's address was devoted principally to the future activities and prosperity of the association.

"Conditions in the district heating field" he said, "have changed considerably since the birth of this association. In 1909 when the leading spirits of the industry organized the association, district heating in general was in an extremely unsatisfactory condition and in very few cases were the properties returning a fair amount upon the capital invested. The future of district heating and consequently the future of any organization representing it were uncertain, and it is therefore not surprising that the first efforts of the association were very modest.

"During the past thirteen years many changes have taken place. Not only has much technical experience been gained in the design and operation of heating plants and distribution systems, but the true cost of service has became known and its commercial value has become more thoroughly appreciated. From the original conception that heating service must be sold at any price in order that electrical business might be secured, we have progressed to a point where in many cities the consumer is willing to pay the full cost of the service in order to secure its many advantages.

"Perhaps Detroit offers the best example of these improved conditions. From a situation in which a very inadequate rate was charged and business only insecurely held, the central heating service in Detroit has progressed to a point where in spite of greatly increased operating costs it has become possible to charge rates sufficient to pay a return upon the invested capital. The almost negligible loss of a few small customers resulting from this large increase in rates has been completely swallowed up by the gain of new business. The Detroit system now serves over 3,600,000 sq. ft. of radiation and is increasing at the rate of about 300,000 sq. ft. yearly. The annual earnings are over $1,800,000.

"I believe that this improvement in Detroit and throughout the country generally has been due to the increased appreciation of the service by the public, more than to any other single factor. This is a natural effect of the development of civilization and I predict that the value of central heating service to the consumer will continue to increase.

"It may interest you to know that a recent survey made by the association of the earnings of its member companies indicates that the total revenue from the sale of heating service is upwards of $20,000,000 yearly. It is true that many properties are not returning a profit, but the reasons why they are not doing so are now thoroughly understood and are being remedied wherever possible.

"So our industry has progressed, since the inception of this association, from its former unsteady footing to its firmly established status of to-day. It is pertinent to enquire whether the association has properly maintained its position as the organization representing and serving such an industry.

"That the association has accomplished much will be denied

by no one. Its efforts have been responsible in no small degree for the progress which the industry has made. Its publications constitute nearly all of the literature on the subject to-day. Its conventions bring together the representative district heating men of the country. But to keep pace with the growth and importance of the industry it appears that there are many ways in which we should enlarge our activities, and I wish to bring them to your attention."

One of these ways, Mr. Walker felt, was in making the association *Bulletin* a monthly, instead of a quarterly, publication. He then mentioned the Association's Handbook, stating that this publication will require continual and consistent work to keep it up to the standard which has been set. This applies to additional data sheets, containing new information, still to be issued, and also the preparation of sections for which there is at present no material.

President Walker thought the annual summer convention might very profitably be supplemented by a Fall convention and said that there should be no difficulty in securing plenty of papers. He felt that while the committee reports were valuable they could be supplemented ot advantage by more papers by individuals.

"We need more reliable statistics," continued Mr. Walker, "regarding the industry. As an association we have very little knowledge regarding the actual condition of the business which we represent. Were funds available it would be highly desirable to conduct a campaign of education of the public as to the true nature of central heating service. The universal lack of knowledge of the scope and possibilities of the service is surprising."

As Mr. Walker pointed out, the association is not carrying out any research work whatever, although there is a vast number of technical problems on which there is little accurate information. He spoke of the data on heat losses from buried pipes secured by Professor John R. Allen in connection with his work as director of the Research Laboratory of the American Society of Heating and Ventilating Engineers and added, "were it financially possible, it would certainly be our duty to support some research work, either by the Research Laboratory or through fellowships established in our technical schools."

He urged the employment of an assistant secretary to handle some of the activities which he urged the association to undertake. He then told of the plan that was being drawn up to increase the revenue of the association and declared, "this is a critical time for the National District Heating Association. The district heating industry is going forward and the association should go forward with it."

REPORT OF SECRETARY-TREASURER.

The remarkable success of the Handbook and of the Association's *Bulletin* was reflected in the report of Secretary-Treasurer D. L. Gaskill. Up-to-date, said Mr. Gaskill, 376 copies of the Handbook have been sold. This revenue, together with that derived from the advertising, totaled $4700. In addition, the copies still on hand together with the binders, are valued at $1526, making a total of $6231. The total expense of publishing the Handbook was $3533, leaving a profit of $2718.

The association's *Bulletin*, he said, is now more than paying its way.

The total income for the year was $6655 and the expenses $8860. This leaves an apparent deficit of $2205 but this is more than balanced by the accounts receivable, amounting to $2682.

Statistics were given showing the present membership to be 2 honorary members, 140 Class A, 83 Class B, 9 Class C, and 43 associate members.

Mr. Gaskill noted the wonderfully increased activity in the work of the association through the pubiication of the Handbook. The Educational Committee, he said is now working upon additional data sheets and these will be mailed out as fast as issued.

One of the member companies has purchased 50 copies of the Handbook, which is an indication, he said, of the value placed upon its contents.

The Auditing Committee's report showed the books to be correct. A report of the Executive Committee was then presented by Secretary D. L. Gaskill, in which he noted the fact that due to the early organization of the council it had been possible to publish practically all of the papers in advance of this meeting. He spoke of the movement to provide for an increase of dues, and this plan was later presented by Davis S. Boyden, chairman of the sub-committee.

The plan as submitted provided for rating the amount of dues of Class A members on the amount of business done, with a minimum rate of $20.00 per year. It was also proposed to raise the dues of associate members from $10.00 to $25.00.

Favorable action on the amendments was taken at the concluding session Saturday morning when the proposals were adopted by unanimous vote without change.

For the Educational Committee, J. C. Hobbs, chairman, stated that the year's work has been confined almost entirely to the Handbook. No additonal sheets have been released during the year, but a number are in preparation. The report recommended that additional advertising be secured to round out the purpose of the Handbook in connection with manufacturers' data. Members were also asked to submit their data for publication in this form.

The report of the Accounting Committee recommended that a uniform accounting system for heating companies be devised for the use of the members. Electrical utility accounting systems, it was stated, had been standardized and it is logical to expect that this will be extended to district heating accounting. It was brought out in the discussion that it will probably not be wise to undertake this work during the coming year. One reason for this, as pointed out by Secretary Gaskill, is that the association should wait to see what action the various public service commissions take on the standardized electric accounting system devised by the National Electric Light Association.

Mr. Hobbs suggested that the Accounting Committee obtain the various methods of classifying accounts used by the different companies and this brought out the statement that in one case where a holding company was operating a number of separate heating plants it had already standardized on the classification of its accounts in most respects.

Before adjourning President Walker announced the appointment of a nominating committee, consisting of F. A. Tucker, chairman; J. C. Hobbs and J. C. Butler.

He also stated that the prize competition for the best set of forms used by central station heating companies had resulted in the receipt of four sets of forms which would be judged by a committee consisting of J. C. Hobbs, chairman; F. B. Orr and W. J. Kline.

Afternoon Session, June 20.

At the opening of the afternoon session Secretary C. W. Obert of the American Society of Heating and Ventilating Engineers, addressed the meeting. He expressed the hope that the two associations would repeat their arrangement of holding a joint meeting, similar to that in Pittsburgh in 1919. No opportunity, he felt, should be missed to have the two organizations work together, and he cited the work of the heating engineers' Research Laboratory as affording such an opportunity.

The Research Laboratory, he said, is now conducting more extensive investigations than have ever been carried on before, even in England or in Germany. The war, he said, has seriously affected such work in both of those countries and in the case of the English investigations, a large part of the partially completed work has been turned over to the Research Laboratory in Pittsburgh.

The report of the Heating Research Committee was presented by H. T. Luscomb, chairman, and is published on another page, practically in full.

Davis S. Boyden brought out the point that the chart showing the pounds of exhaust steam used in a hypothetical case (Fig. 11) might be misleading to some unless it was clearly understood that the "percentage of demand" was taken as a basis. It would have made a clearer comparison possible, he said, to base the results on the pounds of steam per kilowatt hour.

Mr. Hobbs spoke of the statement sometimes made by an operator of an individual building plant that he had enough exhaust steam at all times to heat his building. The heating season, he pointed out, is only 230 days out of 365 so that it would be a far better operating practice to have less exhaust steam available and meet the peak heating loads with live steam.

Mr. Myer said that in Philadelphia it had been proposed in certain cases to do away with central station steam and in one section at the present time $1,000,000 of electrical business may be secured, depending on the ability to supply steam heat. He urged that the committee's work be continued.

Another point brought out in the discussion was that in such cities as Chicago and Cleveland it was customary to figure on an indoor temperature of, say, 63° or 65°, rather than 70° in estimating the probable steam consumption. Practice had shown that the demand eased up very noticeably after the 65° point had been reached.

Mr. Wilder said that the charts should be used with judgment because it is difficult to base the steam consumption on average conditions. If we had any means of saving up the exhaust steam when not needed this would be all right.

In reply to Mr. Boyden, Mr. Luscomb said that the use of the term "pounds of steam per kilowatt hour" would depend on the type of engine, so that he favored the "percentage of demand" basis.

In announcing the next paper on "Value and Method of Steam Generating Plant Interconnection" by J. C. Butler, President Walker stated that it had been prepared as a result of a visit at the plant of the Illinois Maintenance Company where the arrangement of the instrument board aroused his curiosity.

The paper proved to be one that described an evolution of the art in the way of plant interconnection, as distinguished from the block plan and central station plan of heating. Mr. Boyden said that the same idea was about to be adopted in Boston. In another case it was stated that through the interconnection of plants 9 out of 40 stations had been shut down. The plan works very well in connection with coal storage and also as a solution of the summer load problem. With this arrangement steam business can be taken with profit during the summer months only. Mr. Hobbs also endorsed the interconnection idea.

The report of the Heat Utilization Committee included several charts on the same general lines as those contained in the report of the Heating Research Committee. One curve showed the steam consumption in a department store indicating a saving of 20% over the previous year. The second chart was for the Guardian Building in Cleveland and showed savings equal to those reported a year ago.

With such a chart as a basis of comparison, said the report, a building manager soon becomes interested in ways and means of eliminating waste.

The discussion which followed showed how live a subject this is, especially in view of the demand for lower heating rates. If the present rates are to be maintained, said more than one speaker, the consumer must be shown how he can save heat. This, it was shown, is one of the things the association should take up during the coming year and it was suggested that the association publish a circular for public distribution to educate the consumer in the economical use of his heating service.

"We must help the consumer to reduce his bills" was the way J. C. Hobbs put it.

A suggestion in the report of the Heat Utilization Committee that "vacuum pumps and radiator traps should be in such condition that a good vacuum can be easily maintained without the use of cold water" brought up the time-honored argument as to the wisdom of carrying a high vacuum. Mr. Hobbs championed the low vacuum idea, while points on the other side were advanced by representatives of the Detroit Edison Company. Charles H. Day said that there was more danger of corrosion in vapor systems than in vacuum systems.

The session concluded with the report of the nominating committee, the election taking place the following afternoon. The new officers are:

NEW OFFICERS.

President, Edward L. Wilder, manager of the Industrial Department of the Rochester Gas & Electric Corporation, Rochester, N. Y.

First vice-president, Fred B. Orr, Illinois Maintenance Co., Chicago, Ill.

Second vice-president, L. E. Young, Union Electric Light and Power Co., St. Louis, Mo.

Third vice-president, J. C. Hobbs, Duquesne Light and Power Co., Pittsburgh, Pa.

Secretary-treasurer, D. L. Gaskill, Greenville, O. (re-elected).

Executive committee: J. H. Walker, Detroit Edison Co., Detroit; C. H. Day, Cleveland Electric Illuminating Co., Cleveland; and R. A. Heitbrink, Indiana General Service Co., Muncie, Ind.

Morning Session, June 21.

The feature of the Thursday morning session was an address by A. C. Fieldner, supervising chemist of the Bureau of Mines at the Pittsburgh Experiment Station. Mr. Fieldner had prepared a paper on "The Fusibility of Coal Ash," but in his presentation, he discussed the subject with only occasional references to the text. The result was that his talk proved one of the most interesting of the convention and at its conclusion he was given a rising vote of thanks.

The report was also presented at this session of the Station Operating Committee. In the absence of R. D. DeWolf, chairman, who did not arrive until the following day, the report was presented by R. G. Felger, of Detroit and by H. A. Woodworth, of St. Louis. Among the various topics taken up in this report were data on the use of cinder eliminating fans and on feed-water systems. A lengthy discusson followed the presentation of this report.

In closing the session, President Walker stated that the Operating Statistics Committee had gathered considerable material but had not yet been able to put this in presentable form, so that no report would be presented at this time.

Morning Session, June 22.

For the Rate Committee, L. E. Young, chairman, presented a full report in which he stated, among other things, that of the 191 companies included in the committee's survey, only 10 now sell at a flat rate, and the majority of these do so only on account of existing long-term contracts.

A report of the Meters and Accessories Committee was presented by J. C. Butler, chairman, and was a very full résumé of the advances made to date in this field. Descriptions of the various types of meters were given, including the new model 9-31 Republic flow meter, the Bailey totalizing meter, the Kent-Hodgson steam meter, the "straightway" St. John indicating and recording steam meter; also the Adsco rotometer and the Cadillac condensation meter, both of the condensation type.

The concluding portion of the report gave the results of tests of the Cadillac and Adsco condensation meters. These tests showed, among other things, that in the case of the particular sizes of meters tested, the manufacturers have been very conservative in their ratings.

In view of the discussion on steam meters a portion of the "round table" on new appliances and methods, scheduled for the following day, was given at this time. The speakers were R. E. Woolley, of the General Electric Company, who described

a new type of flow meter which his company is about to place on the market; George D. Conlee, of the Bailey Meter Company, who described a new development to take care of low-pressure steam and also told of the company's new pressure-compensating device; C. E. McGregor of the Republic Flow Meter Company; H. V. Redfield of the Central Station Steam Company, who demonstrated the new Cadillac condensation meter; and W. J. Kline of the American District Steam Company, who demonstrated the Adsco improved rotometer, which is now made of Armco iron. Additional details of this appliance were presented by Robert Hall, the secretary of the company.

DEAN ANDERSON'S ADDRESS.

Director F. Paul Anderson of the Research Laboratory of the American Society of Heating and Ventilating Engineers made his first appearance before the district heating engineers. In an address filled with epigrams and running comments on the place filled by the National District Heating Association, Dean Anderson fairly took the meeting by storm. One of his remarks that caught the fancy of his hearers was that "newly-married couples and young college graduates are hard to camouflage."

He emphasized the point that colleges should not expect to turn out commercial engineers but should rather confine themselves to teaching the fundamentals. Years of actual experience in the commercial field are required, he said, before an engineering college graduate can qualify as a commercial engineer.

Speaking of the Heating Research Laboratory he said the laboratory was almost ready to recommend that ozone be used in ventilating work. Also that it was almost ready to fix the ideal indoor air condition as 56° F. wet-bulb, or 68° F. dry-bulb and 40% relative humidity.

Dean Anderson urged the association to lay out a course of study on central station heating for the use of the various universities and to take steps to have such a course added to university engineering curricula.

As Dean Anderson concluded he was given a rising vote of thanks by the convention.

Afternoon Session, June 22.

A report of the Underground Construction Committee was presented by N. W. Calvert, and was supplemented by slides of pipe welding shown by W. J. Kline. These slides included several successful examples of electric arc welding.

Another report presented at this session was that of the Rules and Regulation Committee, E. L. Wilder, chairman. Mr. Wilder stated that new forms were now available in book form, comprising no less than 585 forms secured from 46 companies. These forms are grouped according to companies and supplant those previously secured by the association.

The presence of A. C. Rogers, former president of the association, was noted by President Walker who called upon Mr. Rogers to address the meeting. Mr. Rogers gave some interesting reminiscences of the early days and congratulated the association on its progress.

Final Session, June 23.

Unanimous endorsement of the proposal to increase the membership dues in accordance with the report of the sub-committee on this mater was the first action taken at the final session, Saturday morning.

For the Public Policy Committee, D. S. Boyden presented a report which was described as a classic on the subject. It constituted a general survey of the conditions prevailing in the industry with particular reference to pre-war periods.

The round table on "New Appliances and New Methods" concluded the session, the speakers being C. Gottwald of the Ric-Wil Company, who described two additional types "SPC" and "F" underground tile conduits which have been placed on the market this year; Warren S. Hillis of the American District Steam Company who gave additional details of the Adsco rotometer, and referred to some other appliances which were on exhibition in the convention hall, including a new high-pressure regulator and a new water heater, with steam instead of water coils; D. S. Boyden, who told of the use of standard semaphores on condensate return lines of steam service systems; W. J. Kline, of the American District Steam Company, who showed views of a rewinding attachment for rewinding the record charts of the St. John steam flow meter; A. C. Rogers, of the Flynn & Emrich Company, who demonstrated the Huber hand stoker; J. C. Hornung, who described his latest types of pressure and temperature control valves, with master control, and including those electrically-operated; and L. S. Shaw, of L. S. Shaw & Company, Cleveland, O., who described several devices and appliances, including the Shaw thermostatic regulator, the Key hot joint paste and the Archnu high-temperature cement.

The final and one of the most important papers of the meeting was presented at this time, being on "Central Station Service in Federal Buildings under Control of the Treasury Department," by Nelson S. Thompson, chief mechanical and electrical engineer in the office of the Supervising Architect of the U. S. Treasury Department. This paper was presented by Secretary Gaskill.

Before adjournment, announcement was made of the result of the prize competition for the best set of records maintained by an association member. The prize of $50.00, offered at the instance of the American District Steam Company, was awarded to O. W. Kasten of the Central Illinois Light Co., Peoria, Ill.

Beach Sports Feature of Entertainment Program.

In spite of the cool north wind which kicked up an angry surf on Lake Erie on every day but one of the convention, the entertainment program, with its water sports every afternoon, was carried out in full, to the great delight of the participants, while those who looked on in mock sympathy were given scant consideration by the merrymakers.

Norman W. Calvert, of the Detroit Edison Company, who rounded out his second year at Cedar Point as chairman of the entertainment committee, got the baseball players together on Tuesday, the first afternoon of the convention and put them through a course of training on the beach. The following afternoon the long-looked-for ball game between the East and the West was staged but far be it from the writer even to essay a guess as to which side won the game. Suffice it to say that the prize was split between the two opposing captains, while Umpire Hal. C. Kimbrough, of the American District Steam Company, barely escaped the fate which befell him last year of being carried out to a nice deep spot in Lake Erie and carefully dumped there.

While this was going on, the golf "gang," as it was opprobriously termed, was digging up the turf at the Plum Brook Golf Club, on the outskirts of Sandusky. The principal feature of this event was the remarkable score of 81 gross, turned in by Walter J. Kline of the American District Steam Company, in a round replete with thrills. Mr. Kline lowered the course record from 88.

By night-time the baseball feud appeared to have died down somewhat, at least to the extent that the entire party went together, as guests of the entertainment committee, to visit the concessions on Cedar Point.

The following afternoon, Thursday, the water sports took the form of kite-flying contests, three-legged races, etc., in which the members of the fair sex proved their cleverness and endurance in no uncertain manner.

This event led up to the annual banquet which was held in the dining hall of The Breakers Thursday evening. At the conclusion of the dinner a surprise was given the guests in the form of a one-act sketch on an improvised stage which had been carefully screened or at least camouflaged. The sketch dealt with the troubles which arise in the daily life of the small-town heating contractor. Norman W. Calvert carried the part of the big Swede handyman, while Messrs. Abernathy and Day, as business callers, properly disgraced themselves through their flirtation with the office stenographer.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Western New York and Michigan Chapters Generous Hosts at Society's Two-City Summer Meeting

TO give an adequate picture of the two-city meeting of the American Society of Heating and Ventilating Engineers in Buffalo June 6-7 and in Detroit June 8-10, makes it necessary to refer first to the remarkable entertainment program which filled every available moment of the visitors' time. In addition, the professional program embraced no less than nineteen technical papers on a wide variety of subjects providing in truth "a feast of reason and a flow of soul" seldom equalled and never surpassed at a summer meeting of the society.

By the time the round of festivities in Buffalo came to an end it might have been thought that there was little left in the way of original entertainment for the Detroit hosts to provide, but this was reckoning without the Michigan Chapter whose members had arranged a program which fitted in perfectly with the desires of their many guests.

No sooner had the delegates arrived in Buffalo than they found the members of the Western New York Chapter, under the leadership of W. G. Fraser, general chairman, ready with a warm welcome to the Queen City and full plans for their entertainment. In Detroit the general chairman was F. R. Still and the members found everything ship shape there for the continuation of their meeting as they arrived in Detroit on the morning of the 8th.

How successful the two-city meeting idea was may be gauged from the fact that the total registration was 406. There was also a high average attendance at all of the professional sessions which was more than justified by the character and number of the papers presented.

From a news standpoint no doubt the feature of the meeting was the virtual rejection of a proposed standard code regulating the installation of warm-air furnaces in residences. This code had already been adopted by the National Warm Air Heating and Ventilating Association and the National Association of Sheet Metal Contractors. On coming up to the society, however, its failure of adoption was ascribed to the fact that it does not meet the minimum requirements which the society feels should be embodied in such a code. One of the principal objections was to the provision that partition walls carrying heat stacks to second-floor rooms could be built of 6 in. studding. This was felt as altogether too narrow a width to permit of the installation of warm-air pipes of sufficient size. It was also felt that the code permitted smaller areas for basement pipes than should be allowed.

Opening Session, June 6.

President Jay R. McColl called the meeting to order in the ball room of the Hotel Iroquois, Buffalo, Tuesday morning. Following the invocation by the Reverend Dr. Williams the members were welcomed to Buffalo by C. W. Farrar, president of the Western New York Chapter.

Archer A. Landon, vice-president of the American Radiator Company also made an address of welcome, commenting in an interesting manner on his recent trip through France and Germany. One of his remarks was that, "Germany would declare war tonight if she thought she had a Chinaman's chance of winning." He made the statement that France, determined not to be caught napping by Germany, has taken a preparedness step by placing an order with the French branch of the American Radiator Company for 200 tons of 155 millimeter shells daily, delivery to begin when war is declared.

Under Reports of Chapters, Secretary Obert told of the recent organization of a chapter in Colorado of eleven members and of one in Toronto, Ont. These two chapters, together with the other eleven in existence, have a total membership of 1049, this being about two-thirds of the entire society membership which has just passed the 1500 mark. The Ontario chapter members were present in force and their spokesmen, M. F. Thomas and A. S. Leitch, were given a hearty welcome when they presented a report of their organization. While this branch will be known as the Ontario Chapter, it is intended to have it form the nucleus of a Canadian Division of the American Society of Heating and Ventilating Engineers.

For the Chapter Relations Committee, C. V. Haynes told of the plans that have been laid to devote one of the early meetings of all the chapters during the coming season to a discussion of "Group Heating of Buildings." During the convention a meeting of the Chapter Relations Committee was held to perfect plans for the proposed symposium.

FAN TESTING CODE READY FOR ADOPTION.

Director F. Paul Anderson of the Society's Research Laboratory reported for the Committee on Standard Code for Testing Fans. He said that the work was going forward to apply to both propeller and disc fans. While it was anticipated that there would be difficulty in bringing the fan people together, absolute harmony was found to prevail, so that it took but one day to settle the details to be taken up. The code, he said, is now ready for adoption. There is some question, however, as to whether it is desired to have the heating engineers' society sponsor the code or the National Association of Fan Manufacturers.

Before final action is taken, he said, it will be necessary to have the code adopted by the Fan Manufacturers' Association. While the code is complete as to technical details, there are certain experimental terms still to be added. It will no doubt be ready for final action at the next annual meeting of the society.

For the Committee to Confer with the American Society of Mechanical Engineers' Boiler Code Committee it was brought out that an effort is being made to revise the heating section of the A. S. M. E. Boiler Code. The revisions are intended to apply especially to the rules for the construction of cast-iron and steel heating boilers, riveting and welding. It is desired to publish these rules, when ready, for the approval and guidance of the public.

Relation of the Architect and Engineer.

The first professional paper was on the subject of "Relation of the Architect and Engineer" by E. P. Bradley. "Perhaps no other branch of engineering, involved in building construction," said Mr. Bradley, "is to go through greater development and progress toward perfection in the course of the coming years than heating and ventilating. This branch of engineering has not progressed up to the present time because of lack of positive research and investigation. No men of the scientific training, such as Steinmetz and Edison, with such intellect, boundless ability and energy, have devoted their lives to the advancement

of the heating and ventilating profession. Perhaps it has lacked the romantic appeal of the newer science, but the desire for the betterment of human health and comfort has now provided an incentive for the advancement of the older science."

"For the first time," continued Mr. Bradley, "this branch of engineering is receiving the attention of the best trained minds and for the first time the government has turned its attention to this branch and extended its aid, leading encouragement to the American Society of Heating and Ventilating Engineers by granting to them the use of one of the most perfectly equipped engineering research laboratories in the world. This aid may be a further manifestation of the paternal spirit that has in recent years been assumed by our national Government, but is a worthy paternalism and a welcome one in happy contrast to some of the disagreeable restraints and directions enforced on us."

Mr. Bradley pointed out that the industry and profession have been developed from general fundamental engineering knowledge and research with no definite idea toward its use in heating and ventilating. Such knowledge or research results as others developed, applicable to their own or allied engineering branches, were simply appropriated. Even at this late date it is doubtful if any two out of ten engineers would arrive at the same result in the calculation of so simple a problem as determining the amount of radiation required in the same building, nor would they agree on the same sizes of mains, risers, connections, boiler capacities and other apparatus entering into a heating system.

The reason for this lack of accord, Mr. Bradley felt, is due to the lack of standardization of an authoritative nature. The engineer bases his calculations on certain known or accepted information, plus such published information or results of private research as manufacturers have seen fit to release, plus the best judgment he is able to command, and a generous factor of safety. Mr. Bradley, however, felt that although uniformly good results were the rule, wide possibility in the way of economy were possible in first cost or in operation and maintenance costs.

"Certainly the thoughtful engineer," he declared, "has produced better results at lower first cost, simpler methods and lower operation charges. Frequently he blazes a new trail with a new development or a new thought, but when he does so, it is in spite of the opposition of the old school, the so-called stand patters." Mr. Bradley urged a closer cooperation on the part of the Society with the American Institute of Architects. "The time is now ripe," he continued, "when these two institutions are to be drawn into closer contact, perhaps as institutions; certainly their personnels, by problems of mutual interest."

In concluding, Mr. Bradley said: "Many of the buildings of today require the cooperation and coordination of the work of the heating and ventilating engineer with the architect. Many times little consideration is given to this feature of the building, and frequently too late. Boiler rooms are located in corners that cannot be used for any other purpose; if ventilation is a requirement, fan rooms are located in out-of-the-way nooks with no way to get fresh air to them or to conceal the duct system without ruining the basement; insufficient space is allowed for stacks, pipe shafts, and risers; radiators are located improperly resulting in inefficient service; fresh-air inlets and vents to rooms are improperly located, resulting in drafts or poor circulation and ventilation, notwithstanding the fact that more than sufficient air may be removed to produce good results; little consideration or allowance is made for pumps, heaters and other accessories that enter into the heating and mechanical plant and they are usually remotely located from the section or apparatus with which they function.

"Somehow it all works out and the plant operates, but the real problem only develops from that point on. The plant is inconvenient to operate, the cost being excessive, maintenance high, and performance disappointing. The net result is a handsome building, elegantly furnished and appointed, well thought-out in plan and detail, conveniently arranged, but lacking in essential comfort.

"Cooperation with and deference to the experience and training of the heating engineer would assure comfort with easy and economical operation, obtain for the architect and his client the best design, and the most economical use of the materials available, would insure the selection of material and equipment best adapted to the situation, and above all secure for the architect an efficient and sufficient system at an agreeable cost, and an installation worked out in harmony with the building design and detail."

In discussing this paper, Edwin S. Hallett urged a cooperation of architects and engineering societies and declared that heating engineers did not have so much trouble as formerly in getting sufficient space for their boilers, radiators, etc. He thought a service would be rendered the architect if the engineer could prepare a booklet on "What the Architect Should Know about Heating Systems." Frank K. Chew analyzed the place occupied by the heating engineer as being on a higher plane than a purely commercial one. "It is necessary," he said, "for the heating engineer to be a business man, but he is also to consider himself as occupying a distinctly higher plane from which he can act for the best interests of the profession."

Afternoon Session, June 6.

A paper on "Modern Fan Design" was presented by H. F. Hagen of the B. F. Sturtevant Company describing the development of a new type with an efficiency of 82%. "It is the first fan," said Mr. Hagen, "that has been able to better the efficiency of the old paddle-wheel type."

EFFECTIVENESS OF SIPHONING AUTOMATIC VENTILATORS.

The next paper was on "Comparative Tests of Automatic Ventilators" by J. P. Calderwood, A. J. Mack and C. J. Bradley of the Kansas State Agricultural College. This paper included the data published in THE HEATING AND VENTILATING MAGAZINE for April, 1922, by Professor Mack and C. J. Bradley and included reproductions in half-tone of the various ventilators tested.

"A comparison of the siphoning types of ventilators with those of the non-siphoning types" concluded the authors, "show that some of the non-siphoning types are as effective as some of those employing the siphoning principle. This fact led to a special investigation which had for its object the determination of the effectiveness of the siphons. In this part of the work, the siphons on the windward side of the ventilator were closed by wads of paper and invariably the effectiveness was not decreased.

"A further study of the effectiveness of the stationary siphoning types was made to determine what factors in the design made those of one manufacturer better than another. This study was decided upon because most of the ventilators in this classification were practically the same in general measurements. It was found that the width of the storm band played an important part, the wider the band, the greater the effectiveness.

"The results also seemed to show that the addition of the flutes for producing the siphoning acted as a secondary storm band and that those ventilators in which the angle of the flutes were small proved the most effective. This later conclusion was explained by the fact that with ventilators whose flutes were steep, more difficulty was encountered by the air in entering the ventilator. Consequently, less air entered that had to be exhausted and the exhausting power of the ventilator could be utilized in inducing air through the ventilator rather than removing air that had been introduced for siphoning.

"The results of this investigation seem to indicate that the most effective action of the wind in inducing air through a ventilator is the vacuum produced in the wake of the wind. The ventilators which showed marked effectiveness in these tests took advantage of this principle. Those ventilators which

THE VERY LATEST NEWS

BUFFALO EVENING TIMES

FINANCIAL NEWS

Associated Press Dispatches BUFFALO, WEDNESDAY, JUNE 7, 1922. United Press Dispatches

SPORTS AND FINANCIAL FINAL

HEATING AND VENTILATING SOCIETY HERE

Members Meet at Iroquois

Two-day Session Fairly Jammed With Action.

Live-Wire Delegates to Big H. and V. Meeting

Photo in upper left shows some fair workers from Detroit at the heating and ventilating convention, telling a few delegates from Minneapolis of the pep in store for the bunch at Detroit. Middle photo is W. G. Fraser, vice-president of the Power Efficiency Corporation, Buffalo, general chairman of the convention for the Western New York chapter. On right are the national officers of the American Society of Heating and Ventilating Engineers, left to right: E. S. Hallett of St. Louis, member of council; H. P. Wood of Philadelphia, first vice-president; H. J. Meyer of Minneapolis, member of the council; Alex B. McCall of Detroit, president; Conan W. Obert of New York secretary. Bottom photo shows a bunch of theatrical journal men who are invariably to be found at the meetings with their cameras and advertising contracts.

Story of Landon's Big Climb

American Radiator Man Started as Machinist.

Goodbye, Folks, Call Again and See Our Growth

Forget Sordid Commercialism, Says Mr. Chew

Tells Delegates About Fan Code

Boy Delegate's Sunny Smile

C. W. OBERT, JR.

ENTERTAINMENT

Delegates and Wives Have Gala Time Here.

ARCHIE A. LANDON

Bee-Tee-U Flashes

Germany Not Licked, Just Sore, Says Landon, in Warm Address

PERSONAL

Promises Big Development in Canadian Area

Leave Buffalo; Who Said So?

Officers Who Brought Convention Here

Here are the officers of the live-wire Western New York Chapter of the American Society of Heating and Ventilating Engineers. From left to right: President, G. W. Fraser, vice-presidents, George H. Duke and Fred J. Wesler, treasurer, I. P. Wadley, secretary, Roswell Farnham.

Delegates Take Night Sail Up Lake to Detroit

WHAT THE BUFFALO PAPERS THOUGHT OF THE HEATING ENGINEERS' CONVENTION.

presented a large obstruction to the wind, other factors being the same, gave best results.

"The factors which seem to be important in the design of a ventilator are as follows: The area for the outgoing gases should be made ample; in the case of siphoning ventilators the free area should be designed to care for the additional air used in siphoning; the storm band, if used, should be made at least wide enough to prevent entrance of outside air; any provision, whereby the vacuum created by the wind is increased or made more effective, will produce better results.

EFFECT OF WIDTH OF STORM BAND.

"In order to test the effect of the width of the storm band, an experimental ventilator of the plain stationary type was constructed. The storm band was formed by two sheets of tin and made so that the width of the band above and below the ventilator opening could be varied. The size of the tunnel did not permit of a larger storm band than 22 in. and the minimum width of band was 17½ in. The lower edge of the storm band was placed 4 in. below the ventilator opening as this location gave best results. The accompanying table gives the results of this test.

"A comparison of these results indicates that a wide storm band materially increases the effectiveness of the ventilator and that a plain stationary ventilator so equipped is equal in effectiveness to some of those of the rotary siphoning type. While these results may be in error because a ventilator with so great a band width produced so large an obstruction in the experimental tunnel, they do indicate the advisability of considering the storm band as an important part of the ventilator."

RESULTS OF TESTS UPON AN EXPERIMENTAL VENTILATOR TO DETERMINE EFFECTIVE WIDTH OF STORM BAND

Wind Velocity in miles per hour	Velocity induced through ventilator, feet per minute. Width of Storm Band in inches			
	17½	19	20	21
4	130	164	183	202
8	402	432	456	477
12	620	651	680	696

H. M. Hart referred to some tests made by the Chicago Ventilation Commission which credited the highest efficiency to an open pipe. H. F. Hagen stated that it had been demonstrated beyond doubt that a rotary siphoning ventilator is more efficient than an open pipe, at the same time providing the needed weather protection.

Before the next paper was presented, the chairman called upon Henry B. Gombers, secretary of the Heating and Piping Contractors' National Association. Mr. Gombers presented the greetings of that organization, emphasizing the fact that the two bodies have many points of contact.

A paper on "Water Pipe Sizes for Plumbing Fixtures, Branches and Mains," by Walter S. Timmis, was presented by Secretary Obert. This paper included a number of tables on cold water supply sizes for fixtures and maximum flow in gallons per minute, sizes of water supply branches, water risers for manufacturing buildings, loft buildings, apartment houses and hotels; also a table for figuring pipe sizes for giving any desired pressure drop per 100 ft. of run; a table showing water pressure required to deliver water to top of vertical riser with 15 lbs. pressure at the top branch.

Corrosion and Its Prevention.

The concluding paper at this session was on "Corrosion and its Prevention in Vessels Carrying Water" by J. R. McDermet.

Mr. McDermet gave a very lucid explanation of the chemical process which results in what is commonly known as corrosion or rust. He maintained the point which has been frequently made in recent years that, as far as the expectation of useful life is concerned, iron and steel pipes are on a parity. The characteristics of the two metals, however, as far as corrosion is concerned, are quite distinct, since the pitting of the steel pipe exhibits a uniform allocation, while that of the wrought-iron closely follows a fibrous structure.

The fact that water pipes frequently become completely clogged was explained by Mr. McDermet by the statement that not all of the products of corrosion remain suspended in the water. Ordinarily the greater portion of them adhere to the interior of the pipe. An analysis of the scale or corrosion products ordinarily indicate perhaps 15% to be insoluble calcium compounds which are mechanically mixed with the various oxides of iron.

Brass pipe as a substitute for iron pipe was regarded by the speaker as not an answer to the problem, because it also fails from dezincification, this action depending upon the initial zinc content of the brass, as well as its preliminary treatment. The corrosion behavior of brass, he also pointed out, is not pitting or perforation, but embrittlement. In the process of leeching out the zinc from the alloy, the remaining constituents are left in an extremely brittle state. For that reason such pipes usually fail at the threaded joints. Also the life of brass pipe is shortened when used with varying water temperatures as these cause expansion strains.

"Where condensate in central station heating plants is collected and returned," said Mr. McDermet, "the condensed waters are extremely virulent in their corrosion. The return condensate pipes ordinarily do not run full of water, but carry a trickle along their lower side. For that reason failures occur in horizontal runs of pipe and from channeling on the interior, the manifestation being a little furrow or ditch where the stream of water has followed the bottom of the pipe."

SUGGESTED REMEDIES FOR CORROSION.

One of the first remedies suggested was to render the water alkaline. The solution potential of iron, which is the initial incipient cause of all corrosion, varies with the chemical character of the water and particularly with the concentration of hydrogen ion. It is possible, therefore, experimentally to establish a solution density of hydrogen ion at which there will be no measurable tendency of the iron to dissolve. Unfortunately, this concentration is expensive when dealing with huge quantities of water, and it is also extremely difficult, if not impossible, to maintain in boilers and economizers. It is of a characteristic soapy taste which prohibits it in hot water domestic service. It is, therefore, a simple remedy but not a useful one.

"Certain brands of paint are available," said Mr. McDermet, "which are very effective for a limited time, when properly applied. However, pipe lines, etc., are not accessible for the application of paint at the frequent intervals which are necessary."

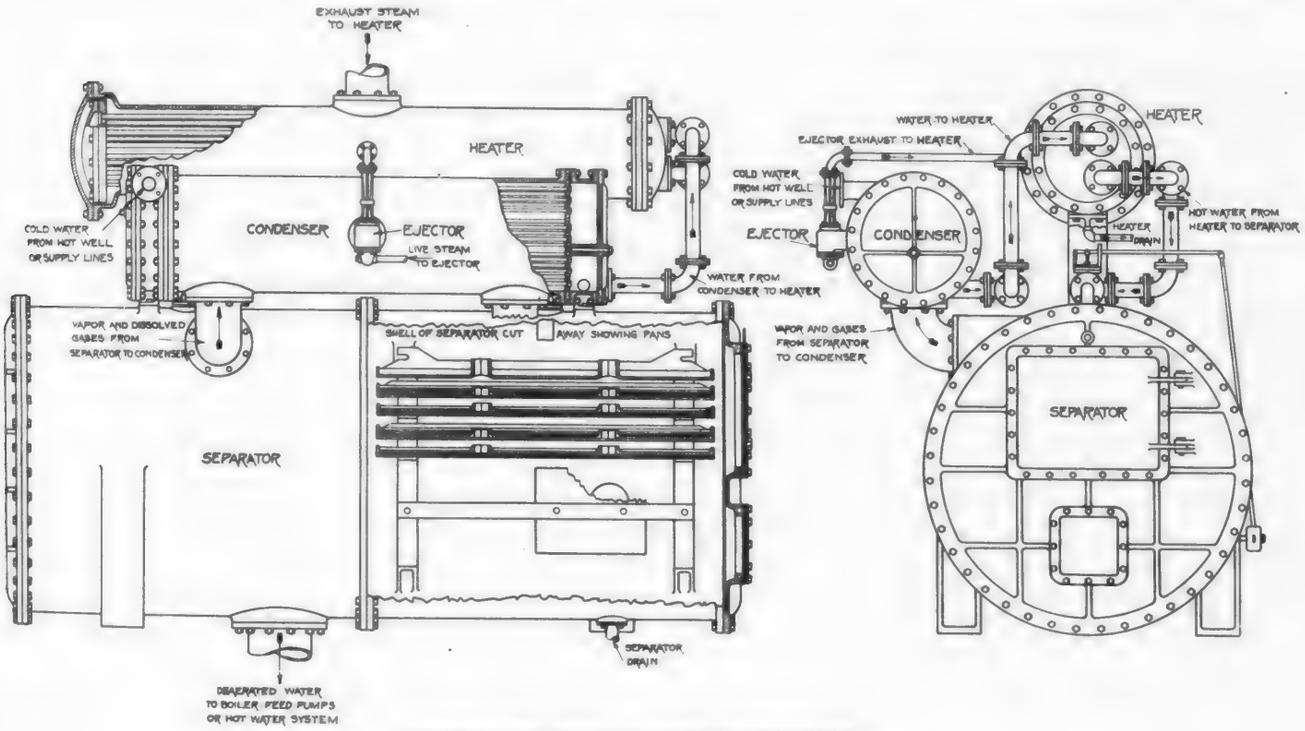
The third method was described as deaeration of the water which aims at the correction of the fundamental cause and automatically uses the inhibitive effects of alkalinity as far as they are practically available.

Mr. McDermet then took up the Elliott process for deaeration of the water through explosive boiling. In explaining this process he said, "Doubtless it is generally agreed that the simplest way of eliminating dissolved gases from water is to reduce the solubility to zero, if this can be accomplished in a practical fashion. It is this feature upon which the Elliott process of deaeration is based, and the methods and apparatus are intended to accomplish this result and at the same time, render the process 100% efficient in heat recovery."

Mr. McDermet showed by reference to the solubility curve for air-gases in water, that boiling was an efficient way of removing dissolved gases from water. Unfortunately, however, the boiling at atmospheric pressure requires a heat source extravagant from the standpoint of heat recovery, and also an excessive boiling loss. Vapor boiling under reduced pressures make

utilizable normal exhaust steam temperatures as heat supply. If some means then are added to permit the heat recovery from the boiling process, the apparatus becomes efficient and serviceable. "This feature," he said, "is the ideal upon which the Elliott process is based."

"While it is possible to boil air out of water," added Mr. McDermet, "it is nevertheless difficult to do it efficiently, and boiling even under atmospheric pressure follows certain definite laws of heat quantities and rate of heat addition. In the Elliott process, heat is added to the liquid under pressure conditions at which the boiling point is not attained. This water heated to a predetermined temperature below its boiling point is then suddenly admitted into a region of vacuum, this vacuum being predetermined in consideration of the initial temperature of admission and the temperature desired for using. When the water enters this region of vacuum, it is superheated and its immediate tendency is to boil with explosive violence at the expense of the heat of the liquid, which was previously added and is now available under the altered conditions of pressure. This explosive boiling results in a minute pulverization of the water as the liquid flashes into steam, and passes off into the region of the separating chamber.



DESIGN OF TYPICAL ELLIOTT DEAERATOR.

"There is still an additional feature to be considered. Ordinarily, bubbles form within the surface of a liquid when the pressure of the water vapor component exceeds the surface tension of the liquid. In superheated liquids, however, there is a probability that the formation of bubbles will take place upon nuclei. Such nuclei are furnished by minute bubbles of air, which have appeared within the body of the liquid due to the reduction of solubility with temperature. When steam bubbles in the explosive process form upon these air bubbles as nuclei, they, in passing off into the region of the vapor space of the deaerator, take with them in mechanical mixture the bubbles of air. Some portion of the action of the Elliott deaerator is, therefore, a mechanical problem of vapor formation and vapor mixture."

The essential fact, it was pointed out, in the explosive boiling is that it is controlled and regulated in accordance with a definite need. Ordinarily, it has been found that a temperature gradient of 22° between the water and the entering liquid furnishes sufficient energy for the explosive boiling and the mechanical separation.

After the explosive boiling which is relied upon to produce the bulk of the separation, the water in spray form is collected and cascaded over corrugated pans, the idea being to agitate the water in the region of reduced vapor pressure, in order to accomplish any residual separation which is possible. Operating results are secured with this method varying from zero to 1/10 cc. of oxygen per liter.

"It has become conventional in both chemical and engineering parlance" said Mr. McDermet, "to express oxygen or air concentration in water as cubic centimeters per liter. It is perhaps a desirable convention, for it has a definite meaning in the metric system and is convertible as parts per thousand by volume in the English system. In the explosive boiling process, heat is liberated in the separator in the form of steam; this heat being exactly proportional to the heat loss in the explosive boiling. The vapors from the interior of the separator vacuum space are conducted to a condenser which is a part of the deaerator, and are condensed, the heat being returned to the cooling water which is the supply going to the heater to be heated for admission to the separator. Dissolved gases such as air and oxygen are, of course, not condensable, and they are removed by some form of air pump, desirably a steam jet ejector, and delivered to the atmosphere. Since the heat involved in the vapors is returned to the cooling water, the heat loss in the process has been substantially zero.

"Control is accomplished by regulation of the vacuum producing characteristics of the air pump, the desired factor being an unvarying vacuum. The condenser's primary function is condensation and heat recovery. It is first desired to return the heat involved in the boiling process to the incoming water going to the heater, in order to make the process 100% heat efficient. It is further desired to remove all vapors and return them to the separator as liquids, thus, relieving the air evacuating means of any necessity of handling vapor. The ejector or air pump, as the case may be, therefore, handles only non-condensable gases, and it controls the vacuum. The condenser, as far as it is a vacuum producing means, is inserted primarily to refrigerate the vapor mixture handled by the air pumps."

Another feature of the condenser performances pointed out by Mr. McDermet is based on the fact that the water to be deaerated in passing through the deaerator chamber liberates a certain amount of heat, which has already been specified as

being approximately that corresponding to a 22° B..T. U. drop.* This represents a definite amount of vapor which goes into the condenser, and the circulation of this condenser is provided by incoming supply. The condenser, therefore, operates under a very definite circulation rate, and its duty from this standpoint is invariable, although the heat handled in gross quantities may be different, that is, in round numbers with a definite circulation rate, there is also an invariable condition of temperature, and a definite relation of steam handled to water velocity. The heat may vary, but the surface remains invariable, and if it is large enough under the maximum loading, it has a higher margin of safety under all other conditions.

"Condensers," said the speaker, "are uniformly of the surface type, although for large installations the jet condenser is employed. Either open or closed feed-water heaters may be used, but in building service for the protection of domestic hot water lines, the closed water heater is almost universal, for the reason that the exhaust steam supplied is almost invariably polluted by the oil from engines, and the mixture of oil with water for lavatory or cooking purposes is impractical. The closed heater also offers more leeway in the matter of location, since pressure of the supply lines may be carried through the heater up to the deaerator admission valve. The closed heater is, of course, undesirable on account of more severe corrosive conditions in the deaerator, as well as its greater cost. Vacuum control is obtained where the steam ejector is used by the regulation of steam pressure on the ejector. Where motor-driven vacuum pumps are employed, the regulation is stop and start, the pump operating in accordance with the load on the deaerator. Where steam ejectors are used a small auxiliary condenser of the conventional surface type is employed to recover the heat in the ejector exhaust; not only the small proportion of vapor drawn over from the deaerator condenser, but also the operating steam heat. The vapors are vented under atmospheric pressure and the condenser operates under atmospheric pressure or with a very slight differential increase. The pump suction on the deaerator is under the same vacuum as exists in the deaerator chamber. On power plant installations, the conditions of headroom, etc., are such that ordinarily the deaerator may be elevated sufficiently above the boiler feed pumps to provide a positive head upon their suction, after the equivalent water column due to the vacuum has been deducted from the static suction head. Such pumps operate in their normal manner.

"On building installations, the headroom conditions are such that there is ordinarily a vacuum upon the suction of the pump. In order to secure reliable operation, it is necessary to vent the suction of these pumps back into the deaerator vapor space and employ a pump of the hot well type. On account of vacuum on the glands, they must of necessity be pressure sealed.

"Pumps may be either of the centrifugal or the duplex plunger type. The simple pump is not applicable to this service because the deaerated water immediately dissolves the cushioning air in the air chamber and produces a water hammer on the line at each stroke of the pump. If the conditions of service are satisfactory, the centrifugal pump is by far the better unit; but the duplex plunger pump, rod-packed type, with water-sealed rod glands is altogether a useful unit."

The paper concluded with a description of methods of determining dissolved oxygen in water.

In the ensuing discussion the need was emphasized of such appliances for small work. One speaker cited a case where a seven-mile underground pipe line had been in use for seven years. It originally operated under 40 lbs. steam pressure and it was necessary later to increase the pressure to 65 lbs. and use two pumps. After installing a deaeration apparatus it was possible to again operate at 40 lbs. pressure. At the same time the repairs, which had averaged from 40 to 50 a year, were reduced to four or five.

Morning Session, June 7.

The meeting Wednesday morning was featured as a research session and was opened with a brilliant address by Dean F. Paul Anderson, director of the society's Research Laboratory. Dean Anderson painted a glowing picture of the work being done at the laboratory and of the immense possibilities before the society in advancing the profession. "Engineers as a class" declared Dean Anderson, "lack culture and the society is doing a public service in showing young men that engineering is an art."

"Why should an engineer get some one else to tell his story for him?" asked Dean Anderson and declared that the results of the investigations at the Research Laboratory would go far in helping heating engineers to place a higher estimate on their profession.

Dean Anderson had some interesting things to say regarding Péclet's work and said that anyone who would take the trouble to look over the three volumes published by this pioneer in the heating field would not fail to be impressed with the remarkable thoroughness of his work, as well as the character of the drawings with which the work is illustrated. "On the subject of drying alone" said Dean Anderson, "there are 45 pages. Just think of it. This is more than would be found in most works of today."

A number of papers were then presented by members of the staff of the Research Laboratory and others as follows:

"Body Temperatures and Their Measurement," by Dr. W. J. McConnell, and F. C. Houghten.

"Standard Method of Testing Dust Removal Efficiencies of Air Washers," by O. W. Armspach and Margaret Ingels.

"Development of a New Method of Making Air Dust Determinations," by F. Paul Anderson and O. W. Armspach.

"Dustiness of Air in Granite Cutting Plants," by S. H. Katz, L. J. Trostel.

In the paper on body temperatures, Dr. McConnell stated that over 1,000 observations of body temperatures had been made to date. While no definite conclusions were drawn, his description of the findings and of the methods used for measuring body temperatures proved most interesting. Visitors to the Research Laboratory, he said, were invariably struck with the sight of the men undergoing this test, with the measuring instruments attached to their half-clad bodies. It gave a human touch to the tests that lingered long after the visitors had left the experiment station.

NEW DEVICE FOR MAKING DUST DETERMINATIONS.

A new method of making air dust determinations was described by Mr. Armspach, consisting of a device which can readily be used commercially. On this account his paper was considered an important step in bringing the results of the Research Laboratories' investigations in this regard down to a practical basis. The point of the paper was that dust can be standardized to the extent of determining the percentages of various substances of which it is ordinarily constituted. Such percentages will then be given a unit value and variations above and below this point will be used to determine the dustiness of the air. One of the problems that had to be solved in developing a device was to provide for an even flow of air despite the increase of resistance. The paper told how this was accom-

* The amount of boiling which is necessary to give the required deaeration is that which is equivalent to a drop of 22° F. in the temperature of the water. That is, giving a concrete example, water at 162° is sprayed into the deaerating chamber which is under such vacuum as to have a corresponding boiling temperature of water of 140°. When the water enters this chamber, its temperature is immediately reduced from 162° to 140° F., or an amount equal to 22°. This means that 22 B. T. U. are given off by each pound of water which is sprayed into the deaerating chamber. These 22 B. T. U. are immediately utilized to convert some of the entering water into steam or vapor, which "represent a definite amount of vapor which goes into the condenser, and the circulation of this condenser is provided by incoming supply."

plished. In order to secure an even distribution of the dust during the test, steam was used to spread it across the intake.

In the ensuing discussion, J. I. Lyle characterized the device as one that will have an important effect on air conditioning work. The tests, he said, that can be made with this appliance, may show that all air washer design will have to be changed. He felt the society was to be congratulated on the development of this dust measuring instrument.

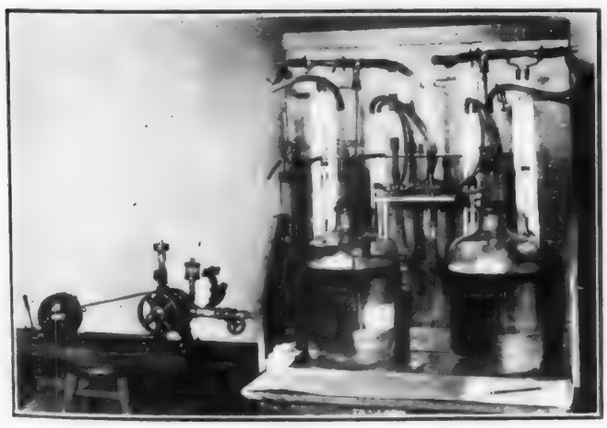
Before the session adjourned, Edwin S. Hallett rose to express

NEW DUST DETERMINATOR DEVELOPED BY HEATING ENGINEERS' RESEARCH LABORATORIES.

his enthusiastic approval of the papers prepared by the Research Laboratory and felt that the character and amount of material might well have been spread over more than one session as there was such a wealth of it that discussion on the many points covered was quite impossible in the limited time available. Mr. Hallett also expressed a general sentiment when he commented on the inspiration which had been given him through Dean Anderson's address. "To those of us who know and love Dean Anderson" he said, "his remarks have filled us with enthusiasm and it is to be regretted if his address here this morning cannot be made available for all of the members of the society."

Morning Session, June 8.

Refreshed by the lake trip to Detroit and in the new surroundings of the Hotel Wolverine, the Thursday morning ses-



TWO DUST DETERMINATORS AND TEST EQUIPMENT APPLIED TO AIR WASHERS.

sion was opened by President George A. Harms, of the Michigan Chapter, who welcomed the visitors. He was followed by George A. Walters, Deputy Commissioner of Police, of Detroit. Mr. Walters, who spoke in place of Mayor Couzens, who was ill, referred to the centralized form of government in effect in Detroit, which is in charge of construction work now in progress involving an expenditure of 100,000,000 a year. The city has a council of nine members instead of thirty-six, and the school board is also centralized with nine members elected at large. Mr. Walters said the city had gone through the conditions of unemployment and was again in a prosperous condition. He mentioned incidentally the fact that the Ford plant had just completed its 6,000,000th automobile.

"There was no special celebration," said Mr. Walters, "but on the contrary the company is proceeding at full speed to turn out another 6,000,000 automobiles."

Vice-President H. P. Gant also addressed the meeting, and President McColl then took the chair.

REPORT OF FURNACE CODE COMMITTEE

The first item on the program was a report on the proposed standard code for regulating the installation of warm air furnaces in residences. In presenting this report, Professor J. D. Hoffman, chairman of the joint committee, told of the efforts that had been made to secure a code that could meet with the approval of the society. He said the various interests involved had been meeting ever since last October and had found it difficult to come to an agreement. Finally the whole committee was cut down to six and an agreement was secured on a standard code. The code as presented has been adopted by the National Warm Air Heating and Ventilating Association and by the National Association of Sheet Metal Contractors.

When finally approved by the other two organizations, that is, the Western Warm Air Furnace and Supply Association and the American Society of Heating and Ventilating Engineers, it is proposed to issue 500,000 copies for distribution throughout the country.

Professor Hoffman called attention to some minor changes that he felt should be made before the code could be adopted. Although the code, he added, was far from meeting the ideal, it was probably the best that can be obtained at this time.

F. R. Still expressed serious opposition to the adoption of the code by the society, arguing especially for wider studs than the 6-in. size provided in the code. He also suggested changes in the formulas for determining the size of warm air pipes to the various floors. As Mr. Still was to present a paper at a later session on the same general subject, it was voted to postpone further consideration of the code until the Saturday morning session. At that session, Professor Hoffman proposed the adoption of the code with certain reservations. The substance of these reservations were presented by H. M. Hart and included changes in the factors used in the rules for determining the sizes of the warm air pipes.

An animated discussion followed over the advisability of endorsing the code until the needed changes had been made. Mr. Still took the ground that the society could well afford to withhold its approval until the code had met the minimum requirements, while Professor Hoffman held that the warm-air furnace situation was on such a rule-of-thumb basis that any code that would improve conditions was worthy of the society's support. He also felt very strongly that if the society failed to take favorable action, the code would go into effect anyway and the society would lose its opportunity to influence the progress of the furnace heating industry.

H. J. Meyer made the point that if the code had been submitted in its present form by the committee for adoption, he would support the proposal. As the matter stood, however, the code was confessedly insufficient and was only being supported as a compromise. He felt, therefore, that it should go back to the committee for further revision.

On submitting the matter to a vote, Mr. Still's proposal was supported and the code returned to the committee for further revision. Thereupon Professor Hoffman rose to state that he felt that he had gone as far as possible in the work and presented his resignation as general chairman of the society's Committee of Furnace Heating.

The session concluded with an interesting paper on "The Intermediate Schools of Detroit" by H. W. Anderson.

Morning Session, June 9.

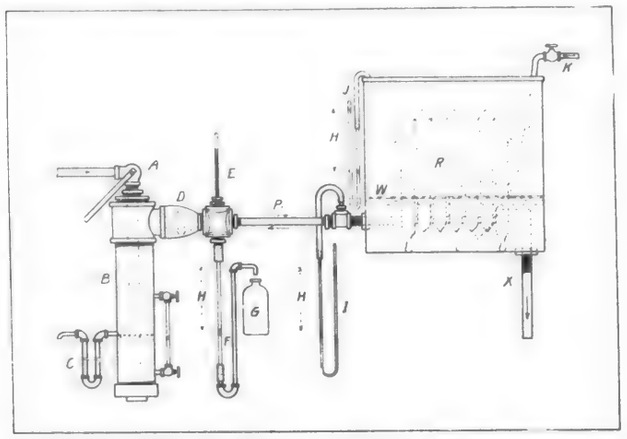
A paper held over from the Thursday session was presented Friday morning on "Ventilation Fundamentals, Where Does the Society Stand?" by Dr. E. V. Hill. This paper contained the results of a number of tests on the ventilation of buildings,

compiled according to the Synthetic Air Chart method. Among other things the charts showed the higher percentages of good ventilation secured through the use of ozone, with recirculated air, and Dr. Hill suggested that the society establish a minimum percentage of ventilation according to the Synthetic Air Chart that would be considered standard.

The meeting then resolved itself into a pipe size session and the chair was turned over to C. V. Haynes, chairman of the Committee on Steam and Return Main Sizes.

A paper was presented by Professor F. E. Giesecke, of the University of Texas, on "Critical Velocity in One-Pipe Steam Systems." This paper supplemented one presented by Professor Giesecke several years ago on the same subject and described a testing method followed by him in determining such critical velocities. For the purposes of the test a radiator was submerged partially filled with water. His principal reason for presenting the paper, he stated, was to obtain criticism on the method of testing.

In the accompanying illustration of the experimental apparatus used by Professor Giesecke, A is a hand-operated modulation valve, B is a steam separator which also serves to take up any superheat which the steam might contain due to passing through the pressure-reducing valves, C is the overflow from the separator, D is the insulated connection between the separator and the test specimen, E is the thermometer, P is the specimen



APPARATUS USED BY PROFESSOR GIESECKE TO DETERMINE CRITICAL STEAM VELOCITIES IN RADIATOR RUNOUTS.

tested—a short horizontal pipe, F is the discharge pipe for the condensate and also a manometer for determining the pressure of the steam, G is the vessel for measuring the condensate, I and J are manometers for determining steam pressures, H is the water column balancing the steam pressure in different parts of the system, R is the radiator in which the steam used in the test is condensed, W is the surface of water surrounding the radiator in order to increase the condensing capacity of the radiator, K is the pipe supplying cooling water to the radiator, and X is the discharge pipe through which the water leaves the cooling tank.

To conduct the test, dry, saturated steam at a definite and constant pressure is allowed to flow through the pipe P into the radiator R. At the same time the condensate is returning from the radiator through the pipe P and is flowing into the vessel G. The time required to fill the vessel G is carefully measured. The pipe X is then given a half turn so as to raise the water level in the tank about 1/16-in. The condensing capacity of the radiator is thereby increased slightly and the time necessary to fill the vessel G decreased correspondingly.

This process is continued until the shortest period of time is determined in which the vessel G can be filled with condensate returning through the pipe P against the flow of the steam. The velocity of the steam corresponding to this shortest period of time is the "critical" velocity. When the velocity of the steam is increased above the critical velocity, some of the condensate remains in the radiator and the time necessary to fill the vessel G increases.

By this method the critical velocities of steam in short vertical pipes, in short horizontal pipes, in circular orifices in thin metal sheets and in radiator valves have been determined for steam pressures of 4 in., 12 in. and 20 in. of water. The tests indicate that the critical velocity is practically independent of the pressure, that it is higher for vertical than for horizontal pipes and that it increases slightly with the diameter of the pipe.

The actual critical velocities will be published after they have been carefully checked; the following table shows the general nature of the results:

CRITICAL VELOCITY OF STEAM IN FEET PER SECOND IN HORIZONTAL PIPES, 12 IN. LONG.

Nominal Pipe Size In.	Slope of Pipe, Inches per Foot.	Pressure, Inches of Water 4	12	20
1	1/32	22.2	22.4	Incomplete
1¼	1/32	22.5	22.8	22.6
1½	1/32	23.2	23.7	23.3

Note: There was no appreciable drop in the pressure of the steam in passing through the pipe into the radiator; i. e., all three manometer tubes showed practically the same pressure at all times.

A paper on "Capacity of Steam Heating Mains as Affected by Critical Velocities of Condensate Mixtures," was presented by F. C. Houghton and L. Ebin. The paper gave the results of 30 tests on steam velocities in risers and it is proposed later to make tests on many other arrangements of piping. The results of the 30 tests on one-pipe risers are shown in the accompanying illustration in which the total condensation, or the capacity of the pipe for carrying steam with the counter flow of condensed water, is plotted against pressure drop per 10-ft. length of pipe. It will be noted in this illustration that there is also a curve giving the theoretical capacity of a 1-in. pipe for dry steam. This curve is plotted from the Unwin formula.

The curve for the 1-in. pipe riser closely follows the theoretical curve for the same size pipe, carrying dry steam, for

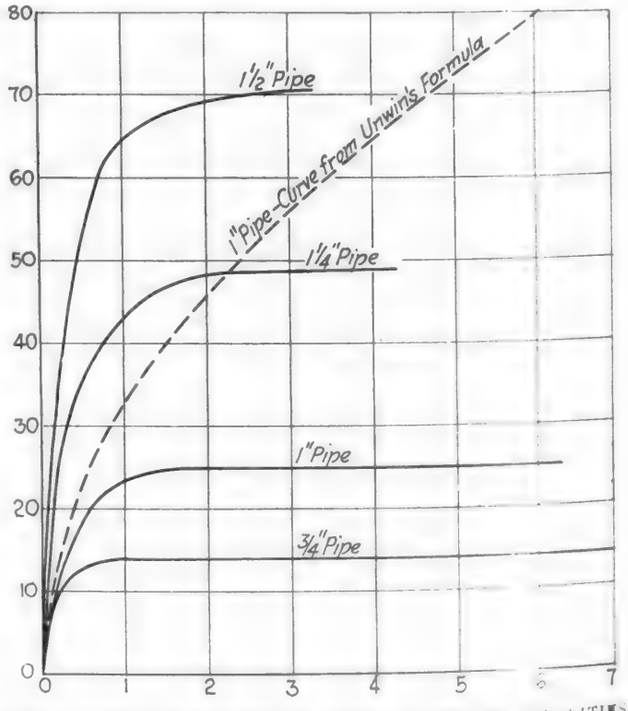


FIG. 1.—RESULTS OF THIRTY TESTS OF STEAM VELOCITIES IN RISERS.

pressure drops less than 0.3 in. of water. As the pressure drop increases beyond this point the increase in capacity of the pipe diminishes. For pressure drops greater than 1½ in. of water the capacity of the pipe is practically constant. However, the larger the pipe the less abrupt the departure from the curve for dry steam.

For pressure drops greater than 0.3 in. of water a gurgling sound can be heard in the radiators. There is, however, no noticeable change in the continuity of flow of the condensate until pressure, ranging from about 6 in. of water in the ¾-in. riser to about 4 in. of water in the 1½-in. riser, are reached. Beyond this point, which is not very sharply defined, the return flow of condensate is intermittent. With intermittent flow the capacity of the pipe increases but not consistently.

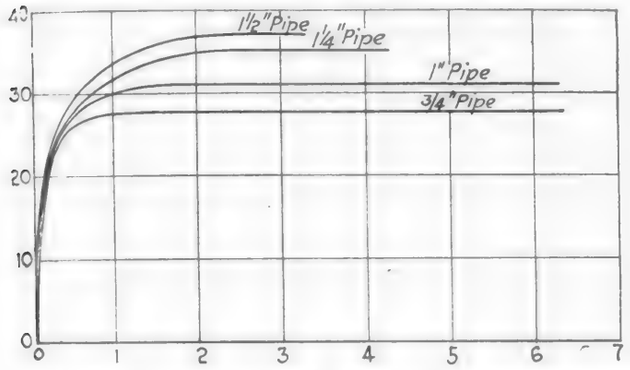


FIG. 2. STEAM VELOCITIES PLOTTED AGAINST PRESSURE DROPS IN STEAM RISERS.

During one test with a 5-in. pressure drop the condensate returned at very regular intervals of 12 minutes. The return of condensate ceased entirely for a period of about eleven minutes and then flowed at full pipe capacity for about one minute. This means that the steam flowed unhindered by returned water for about 11/12 of the time while it was completely shut off for about 1/12 of the time. These conditions would be expected to give a greater flow of steam than where the flow is constantly hindered by a lesser amount by the returning water.

In Fig. 2 the velocity of the steam in the one-pipe risers is plotted against pressure drop in inches of water. These curves show the same characteristics as those in Fig. 1. The velocity indicated by the pressure at which the capacity of the one-pipe riser departs from the theoretical capacity of the same pipe, for dry steam, is the critical velocity of that pipe.

While sufficient data have not as yet been collected to allow the forming of conclusions which can be accepted as final, certain tentative conclusions may be drawn from the curves.

1. There is a maximum capacity of a one-pipe riser for the flow of steam, above which any further increase in pressure drop will not increase the flow of steam.

2. The critical velocity of steam and condensate mixtures in one-pipe risers, as indicated by the departure of the capacity-pressure drop curve, from the theoretical curve, for dry steam, is approximately 22 ft. per second. This is further verified by the gurgling or surging sounds in the system when this velocity is exceeded.

In the discussion Charles F. Eveleth, chief engineer for Warren Webster & Company, told of some tests of radiator run-outs made in the laboratory of this company's plant in which glass tubes were used. These tubes were so arranged that the steam could be supplied downward to the run-out or upward. It was also possible to regulate the slope of the run-outs. It was noticed that when steam was first turned on, a film of water formed in the pipe which increased in volume, the steam causing it to assume the form of waves as it passed over the water. This continued until the velocity was reached at which the water was carried along with the steam. In these tests it was found that the critical velocity was 1350 ft. per minute.

Dean Anderson pointed out that here were three investigations which agreed on about 20 ft. per second for the critical velocity of steam. In this connection he announced that the Johnson Service Company had offered the use of its $25,000 laboratory to the Research Laboratory for use in its testing work.

Dean Anderson stated that it was planned to make additional tests at the laboratory that would cover other pressures. This was in response from an inquiry from Mr. Meyer as to the results found with 1-lb. pressure in gravity one-pipe systems.

A final paper of this session was on "Theory for the Flow of Condensation in Return Pipes," by R. V. Frost.

At the conclusion of this paper, J. E. Bolling, secretary of the Guide Publication Committee addressed the meeting on the subject of the society's Guide. Advance unbound copies of this publication were handed out and enlisted many favorable comments. Mr. Bolling told of the numerous difficulties encountered in getting out the first number of the Guide and roused his hearers to a high pitch of enthusiasm by his presentation of the important service which the Guide could render as it grew in size and influence. He stated that the initial number would make a very healthy beginning, but that it would be easy to go on from there to big things. Mr. Bolling thought the Guide could easily be made such a paying proposition that it would defray, to a large extent, the expenses of the Research Laboratory.

Final Session, June 10.

Following the presentation by title of a paper by J. A. Donnelly on "Temperature Control by Fractional Distribution of Steam" a paper was presented by F. R. Still on "Recent Developments in Warm Air Furnace Heating."

Recent Developments in Warm-Air Furnace Heating.

Mr. Still reported that a wealth of data never before obtainable has been made available through the research work conducted at the University of Illinois through its agreement with the National Warm Air Heating and Ventilating Association. With these data it is now possible to calculate the size and performance of a furnace with about the same degree of accuracy as the size and performance of a steam or water boiler.

He referred to the warm-air furnace code which has lately

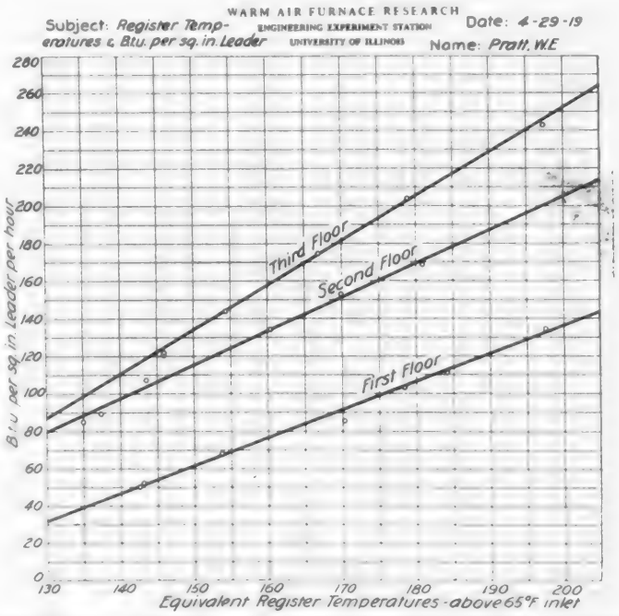


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FIG. 1.—CHART FOR DETERMINING SIZES OF WARM-AIR FURNACE LEADERS.

been adopted by the furnace men's association, and characterized it as a step in the right direction. The formula given in the code for determining the sizes of leaders to the various flues and registers, as devised by P. J. Dougherty, engineer of the International Heater Company, is based on the following:

Knowing the heat requirements of a room, the size of leader can be found directly from one of the charts published by the University of Illinois (Fig. 1). By referring to the chart it will be seen that at a temperature of about 195° there was obtained 125 B. T. U. per square inch of leader per hour to the first floor. Hence, dividing 1000 by 125 will give 8 sq. in. per 1000 B. T. U. Therefore, 10.4 × 8 = 83.28 sq. in. area of leaders to the room if it is on the first floor. This is about the area of a pipe 10 in. in diameter.

If the same temperature of 195° is assumed for determining the second and third-story pipes their area should be respectively 5 sq. in. to the second story and 4 sq. in. to the third story per 1000 B. T. U. exposure. Thus, for a similar room on the second floor, the area of the pipes would be 52 sq. in., or an 8-in. diameter pipe to the second story, and 41.64 sq. in., or a 7-in. diameter pipe to the third story.

It was decided by the code committee to allow 6 sq. in. to the second story and 5 sq. in. to the third story, which is equivalent to a temperature of about 176°. Using that basis, the pipe to the second story would be 9 in. diameter and to the third story, 8 in. diameter. Mr. Still thought that undoubtedly the code will be amended so as to provide for a lower temperature to the first story. This will mean allowing 9 sq. in. per 1000 B. T. U., or 93.6 sq. in. in the leader pipe, or 11 in. diameter, instead of 10 in. as provided by the present code.

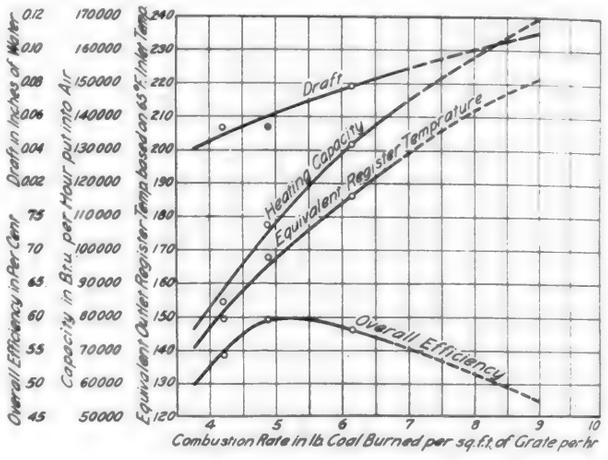
Reducing the allowable temperature from 195° to 176° evidently increases the area of the leaders to the first story more than 20% above what is now the average practice, but it will avoid the necessity for maintaining such high temperatures to get sufficient heat.

In everyday practice, continued Mr. Still, when calculating the size of the leaders to the various rooms in the building, one would proceed about as follows:

If it is felt that an air change of 1½ times per hour should be provided for, instead of 1 air change per hour, then substitute 600 in place of the factor 800. For 2 air changes, the factor would be 400.

Speaking of the need for increased wall stack size, Mr. Still suggested that one way to overcome this condition is to insist that all walls carrying warm-air flues be built of studs not less than 2 in. x 6 in. and spaced 20 in. centers, to allow for flues of sufficient size.

Mr. Still's paper also contained the chart developed by the University of Illinois (Fig. 2) for determining furnace sizes. In connection with the test at Urbana it was found that by making the return air duct to the furnace the same size, or even larger than the combined area of all the leaders, and at the same time avoiding abrupt turns in this duct, the capacity of the furnace can be increased as much as 50%. It was further demonstrated that the furnace is affected much more by any restriction to the flow of air in the recirculating duct than by a similar restriction in the leaders from the furnace to the registers. The use of two or more recirculating ducts was shown to be poor practice.


Draft in Inches of Water
Capacity in Btu. per Hour put into Air
Equivalent Outlet Register Temp. based on 65° Inlet Temp.
Overall Efficiency in Per Cent
Draft
Heating Capacity
Equivalent Register Temperature
Overall Efficiency
Combustion Rate in lb. Coal Burned per sq. ft. of Grate per hr

(Published by permission of Engineering Experiment Station, University of Illinois.)

FIG. 2.—CHART FOR DETERMINING WARM-AIR FURNACE SIZES.

THE CONVENTION PARTY OF THE AMERICAN SOCIETY OF HEATING

USE OF BLOWERS IN CONNECTION WITH WARM-AIR FURNACES.

The concluding portion of the paper was devoted to the use of blowers in connection with warm-air furnaces. Rightly applied, said Mr. Still, a blower will effect economies that cannot be duplicated in any other way. Its efficiency rests in the fact that it removes the film of air in immediate contact with the heating surface more rapidly than it can be removed by gravity. In this way, he stated, the capacity of a furnace can be increased from two to three times. To secure good results, however, such a blower must operate continuously so long as heat is needed due to the fact that dampers have to be set in the leaders to equalize the air flow. Mr. Still predicted that some day "circulators" will be considered as necessary as any other part of a furnace plant as, among other things, they permit the air to be circulated at more healthful temperatures.

At the conclusion of this paper the discussion of the proposed warm-air furnace code was taken up and action taken referring the code back to the committee with suggestions for modifications, as stated in the account of the June 8th session.

Percy Nicholls, who recently joined the staff of the society's Research Laboratory, made his début in that capacity with two papers. One was on "The Derivation of the True Thermal Conductivity Coefficient from Overall Test Results," and the other on "Eugene Péclet as a Heating and Ventilating Engineer." In his first paper he showed that the thermal conductivity coefficient of most materials varies with and has a definite value for each temperature. When the method of tests only gives the overall value of heat flow for an appreciable thickness of the material, the coefficient deducted is only for the temperatures at the surfaces. His paper developed a method for deriving a curve of conductivity coefficiency against temperature and showed how such values could be applied to facilitate more accurate and simpler computations of applications of the material to practical conditions. The paper went at length into the mathematics of the problem and included curves based on these calculations.

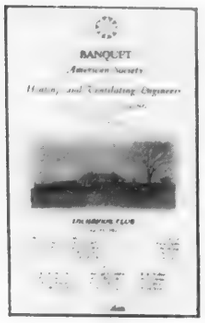
His paper on Eugene Péclet was illustrated by lantern slides reproducing a number of the more important illustrations taken from Péclet's works. This proved a most interesting presentation and showed that many of the ideas in common practice today had been thought of by that early pioneer. As illustrating the limitations under which the engineer of that time worked, a design was shown of a mechanical fan installation which was intended to be operated by man power on the order of the old-time organ blower.

One of the most interesting papers of the entire meeting was presented at the end of the closing session by M. G. Harbula of the Atmospheric Conditioning Corporation, on "Air Conditioning for Sausage Manufacturing Plants." This paper was also illustrated by lantern slides and at its conclusion Mr. Harbula passed around samples of sausages as conditioned in some of the typical plants described. He gave an interesting summary of the problem met in conditioning sausages, color being an important factor. The best temperature for this work was found to be between 54° and 60° F. with a relative humidity averaging from 55% to 65%. "Slimy sausage," he said, "will not take smoke and if too dry it is likely to case-harden." The importance of proper air distribution was emphasized as local stagnation must be prevented. "Sausage meat," said Mr. Harbula, "must dry from the inside out." The air conditioning equipment used in the installations described by the author included a spray-type humidifier. In one place the equipment paid for itself in four months in reducing the time of smoking and curing the sausages, at the same time greatly improving its quality and color. With such conditioning the product is made uniform and shipping dates may be anticipated. The temperature scheduled for the holding rooms is 40° and dry and for the packing rooms from 56 to 66° and sufficiently dry to prevent condensation of moisture.

Before the meeting adjourned, President Harms of the Michigan Chapter expressed the appreciation of that chapter for the success of the meeting which, as he graciously expressed it, was due to the visitors. Professor Hoffman presented a resolution of thanks to the Western New York and Michigan Chapters for their royal hospitality and this was adopted with enthusiasm.

VENTILATING ENGINEERS AT THE BUFFALO AUTOMOBILE CLUB, JUNE 6.

Elaborate Entertainment Program Carried Out by Western New York and Michigan Chapters.



Thanks to the preparation of the Buffalo committee of the Western New York Chapter everything was in readiness at the Hotel Iroquois for taking care of the guests on their arrival, June 6. Registration rooms were conveniently located in the Engineers' Club on the main floor of the hotel. Here the guests received their coupon tickets for the various events in Buffalo, accompanied by souvenir pencils bearing the insignia of the chapter. The local committee, headed by W. G. Fraser, and President C. W. Farrar of the Western New York Chapter, was on hand to welcome the visitors.

Following the first business session, while the ladies were being entertained at a formal luncheon at the Hotel Iroquois, the members partook of a buffet luncheon in the convention hall of the hotel. Directly after the afternoon session on Tuesday, a fleet of automobiles decorated with society banners and making their presence felt in no uncertain terms, took the entire party on a 17-mile ride to the Buffalo Automobile Club. The weather was ideal and the event proved one of the most delightful features of the meeting. The route lay through Buffalo's residential district which met every claim which had been made for it by the Buffalonians.

Arriving at the club house a group picture was taken on the lawn and the party then repaired to the club rooms where a dinner dance was staged, "with all the fixin's." The gaiety continued until a late hour and was only broken up by the prospect of additional events still to be enjoyed.

The ladies were up bright and early the next morning for a trip to Niagara Falls while the men enjoyed a formal luncheon as guests of the Western New York Chapter. In the afternoon parties were made up to visit the plants of the American Radiator Company, American District Steam Company and the Buffalo Forge Company.

All of the party returned in time to board the Cleveland III for Detroit. The delay in the serving of dinner only emphasized the prodigious appetites which had been acquired by everyone and the entrance of the first course was greeted with cheers. While many repaired later to the upper decks to enjoy the sail up Lake Erie, others devoted the evening to dancing on the lower deck to the strains of an orchestra brought along especially for the occasion.

Detroit was reached on time Thursday morning and the Michigan Chapter committee made its presence felt at once. Busses were in waiting at the pier to take the party to the Hotel Wolverine.

Luncheons for the ladies on both Thursday and Friday were given at the hotel. Thursday afternoon the men were taken through the Detroit Intermediate Schools, the power plant of the Detroit Edison Company, the River Rouge Plant of the Ford Motor Company and the plant of the U. S. Radiator Corporation in separate parties. In the evening all went in a body to inspect the exhibit of the National Association of Master Plumbers in the General Motors Building. This included a number of heating exhibits.

The climax of the meeting was reached Friday afternoon and evening when the entire party was taken in automobiles to the Lochmoor Club at Grosse Point for a dinner dance and entertainment. At the dinner souvenirs were distributed in the form of silver pencils for the men and vanity boxes for the ladies. In addition a golf tournament was put on in the afternoon while the ladies played bridge on the club house veranda.

Many comments were heard on the beautiful picture presented as the dancing commenced. President Jay R. McColl and Mrs. McColl led the grand march, the line fairly filling the large ball room of the club. The general effect was heightened by the contrast with the conditions outdoors as a violent thunder storm raged during a large part of the evening. Professional entertainers were on hand to lend additional distinction to the evening.

The golf match was a blind handicap affair, the winners of which were N. Loring Danforth of Buffalo, 81 net and W. B. Johnston, 82 net. In the gross score competition, the winners were C. H. Sodenberg, associate of R. S. M. Wilde, 98 gross; W. B. Johnston, 102 gross. The prizes were donated by J. L. Fuller, western sales manager of Hart & Crouse Company, and George Cage, assistant sales manager of Detroit Lubricator Company.

The entertainment at the dance was planned and directed by Frank E. Peckham, engineer for John J. Davis Sons & Co., Inc.

The following Michigan Chapter committee chairman came in for hearty congratulations on their success in staging what was one of the most successful conventions ever held by the society:

General chairman, F. R. Still; organization chairman, J. L. Fuller; information, J. F. McIntire; hotel and publicity, C. W. Locker; finance, W. L. Johnston; treasurer, H. A. Hamlin; acquaintance, E. L. Downs; auto and transportation, N. J. Diebolt; ladies, J. B. Dill.

THE HEATING ENGINEERS' CONVENTION PARTY AT THE LOCHMOOR COUNTRY CLUB, DETROIT, JUNE 9.

CORRESPONDENCE

The School Child the Window and the Fan.

BY GEORGE T. PALMER, D. P. H.

EDITOR HEATING AND VENTILATING MAGAZINE:

In the May, 1922, issue of THE HEATING AND VENTILATING MAGAZINE, Mr. C. A. Booth, vice-president of the Buffalo Forge Company, discusses an article entitled "Where We Are At in Present Day Ventilating Practice." As one of the persons evidently referred to by Mr. Booth as a "faddist" and who "have started out to prove something and are not hampered by facts," I would request the privilege of presenting several comments.

A preliminary report on a ventilation study of the New York Schools was made by Dr. S. Josephine Baker, director of the Bureau of Child Hygiene of the New York City Health Department in 1918.

A more extended report on the subject was published by the writer in 1921, appearing in the Journal of Laboratory and Clinical Medicine for August, September and October, 1921 (St. Louis).

Dr. Baker is no faddist. She is a highly esteemed sanitarian standing at the top of her profession. She is primarily interested in the health of school children. She discusses the prevailing methods of school ventilation with reference to their influence on the public health. She is thoroughly qualified to express an opinion on this subject, and her opinions are entitled to respect, even by those who differ with her.

The study in question was conducted jointly by the New York City Health Department and the New York State Commission on Ventilation, with which the writer served as chief of staff. The personnel of the Ventilation Commission comprised men of prominence and integrity in their separate fields—a physiologist, a sanitarian, a psychologist, a ventilating engineer, a physicist and chemist and a physician. It was a non-partisan commission with no axe to grind. Its aim was to discover some truths about ventilation and health.

This study was made on existing ventilation systems. Three schools were of most recent construction, one opened in 1914 and two in 1915. It is true no unusual effort was taken to see what the systems could do. The study was based on what they did do. In some of the schools the ventilation systems were operating under most satisfactory conditions. In others they were not. They were all in operation during the tests. The buildings chosen for the test were selected after consultation with Mr. Frank G. McCann, heating and ventilating engineer of the New York City Board of Education. Over 50 schools were considered, and more than half were visited by the writer in the endeavor to obtain fair samples for the test.

It is stated in Mr. Booth's comments that I disregarded the results of the test in the Detroit schools, which he states showed results clearly in favor of mechanical ventilation.

I do not disregard the results of the Detroit experiment. The Detroit tests do not contradict the New York results. Mr. W. Frank Walker, sanitary engineer and Deputy Commissioner of Health, has informed me that in the window-ventilated rooms of the Detroit tests the windows were covered their full length with muslin screens, that there was no gravity exhaust, the exhaust ducts being blocked off, and that extra direct radiation was installed, making a total of from 300 to 400 sq. ft. in each room. This type of room with windows covered by muslin screens and with no gravity exhaust is unsatisfactory, just as the New York Commission found in tests at P. S. 51. In the study reported by Dr. Baker and myself the window-ventilated rooms did not have windows covered with muslin screens and there was gravity exhaust, inadequate though it was in many cases. In the Detroit study absence from school from all causes was used as a measure of respiratory sickness. In the New York study only the absences due specifically to respiratory illness, as confirmed by physicians and nurses, were used as a measure of sickness. The total absence is not a fair measure of respiratory illness, which represents not more than 20% of the total absence from school. Regardless of what the records did show, I should expect the mechanically-ventilated rooms in this study to be superior to the window rooms, as they were.

I do not agree with Mr. Booth that a teacher's opinion on air conditions in her room is to be ignored. The aim of ventilation should be the health, comfort and efficiency of the occupants. There has been altogether too great a tendency to regard ventilation as perfect because its mechanical operation is satisfactory. It is the welfare of human beings, and not the amount of air forced into a room, that should determine the satisfactoriness of ventilation.

If you will give the teacher the **facilities** for maintaining her room within a temperature range of 65° to 70° F., I do not fear for the result. Usually when a room becomes too warm the teacher's only recourse is to open a window. Frequently she cannot do even this, for the janitor usually insists that she close it. She cannot turn off heat in a radiator that is thermostatically controlled. She and the children have to grit their teeth and stand it. The objections raised by the teacher are not hallucinations. There is a physical and physiological basis for her complaint.

I believe in the possibilities of window ventilation with gravity exhaust for the ordinary school rooms. It is possible to ventilate a school room with considerable satisfaction by this means, for I witnessed the fact during a period of two years. The occupancy of the rooms was such that there were 300 cu. ft. per person. There is no necessity, in the writer's opinion, for increasing the cubic space ratio to 1900 cu. ft. per person, as Mr. Booth points out. I do not believe that school auditoria or theatres or other large rooms densely occupied can be dealt with by window ventilation. I do not even discredit all mechanical ventilation for schoolrooms. My contention is that with so much of promise resulting from the operation of window-ventilated schoolrooms with gravity exhaust and with the possibility of doing this with no detriment to the school child, and in fact, with the possibility of even bettering his condition in the things that affect his health, namely, cool rooms with fluctuating air flow, this method deserves serious consideration and trial.

The person in public office who is charged with the responsibility of designing and recommending ventilation methods for public buildings is entirely justified in seeking the most economical means of accomplishing this, providing there is no surrender of the factors that make for human comfort, health and efficiency. If a school child is just as well off in a window-ventilated room with gravity exhaust equipped so that temperature—the most important health factor—can be maintained within a range of 65° to 70°, why insist on maintaining a constant supply of 30 cu. ft. of air per minute per person for the purpose of keeping a constant temperature and carbon dioxide down to 6 parts per 10,000?

The air flow will vary in the window room. It will not be constant. Carbon dioxide will average not lower than 8 parts, but what if it does? The weight of experimental evidence since 1883 contributed by Hermans, Paul, Flügge,

Billings, Mitchell and Bergey, Leonard Hill and the New York State Commission all point to the paramount temperature influence and the insignificance of practical variations in carbon dioxide, so far as health is concerned.

GEORGE T. PALMER,
Epidemiologist, Detroit Department of Health.

Improvements in Railroad Car Heating Systems.

EDITOR HEATING AND VENTILATING MAGAZINE:

I have read with much interest the article on "Steam Waste in Heating Railroad Coaches," appearing in the May issue of your magazine.

You evidently have the correct information as to the present unnecessarily high expense of heating railway passenger equipment at terminals, and I am glad you are giving the matter some publicity.

This is the thing we have, of course, been aware of for years and have only recently been able to interest the railroads to the extent of getting them to go along in their improvements in their car heating arrangements which will save a very large part of this heretofore unappreciated waste of money.

As indicating what my company is doing to save this waste of money on the railroads, I am enclosing you a circular describing what we call our "Double Automatic Control Vapor system." The figures I have used in this circular, you will note, are conservative and the real saving is considerably more than I have indicated, but it was thought best to understate, instead of overstate, the real situation.

The apparatus we have designed and are beginning to market for this purpose is being favorably received by the railroads as it lends itself particularly to application in connection with our regular vapor car heating system which is already standard and in general use on practically 90% of the roads in this country and Canada, and we have good reason to believe that within the next year or so this double automatic control vapor system will be in very general use.

Outside of the general correct design of the apparatus, I think that the most important and really novel feature is the method adopted by which the economical temperature (50°) used during the lay-over periods becomes effective automatically and without any attention or manipulation by employees, and the 70° or service temperature again becomes automatically effective when the train is under steam from the locomotive.

Speaking generally on the subject of car heating, I would also like to point out to you that in using atmospheric pressure steam in the radiating pipes, particularly in long trains, the one common difficulty to overcome is that of freezing up of the drips or outlets of the apparatus when the steam is turned off from the radiating surface inside the cars for the purpose of regulating temperatures. This holds good whether the temperature is controlled manually or automatically, and the one big reason that has made the atmospheric pressure or vapor system possible on 90% of the roads in this country has been the method adopted by us some years ago for shutting off steam from the heating coils without cutting it off from the operating mechanism or drips, thus keeping the drip or outlet of the apparatus operating and hot at all times.

This is known as the "short-circuit cut-out method" and we have, of course, followed this same scheme in the automatic regulating system that has been so universally successful in the hand-operated vapor system.

EGBERT H. GOLD,
President Vapor Car Heating Company.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Western New York Chapter.

William H. Driscoll was the principal speaker at the closing meeting for the season of the New York Chapter, his subject being the heating of skyscrapers. Mr. Driscoll said in part.

"Heating the skyscraper might look to the average contractor as a very large and important piece of work. This mistaken idea cannot be impressed too strongly because I feel that the man that heats the home is doing a more important work and is pleasing an individual who is looking into details more closely than the company or individual who operates a large and important plant.

"The skyscraper is heated because without our type of heat it would be impossible to construct these buildings. The home is heated because the owner demands warmth and comfort for the benefit of himself and his family.

"The story that I will give and the pictures that I will show have to do with the heating of five of the largest buildings in the country, viz: the Woolworth Building, the Equitable, the Union Central Life, the McAlpin Hotel and the Municipal Building, New York City. These types of buildings cover the important class of skyscrapers erected today, viz: a municipal building, a hotel where each guest has to be satisfied with the temperature of his or her room, and several office buildings where the tenantage has to be given proper heat and the radiators so arranged that the different office suites can be built up without any rearrangement of the radiator plans.

"The pictures dwell to some extent on the equipment installed in the Equitable Building. Plans and prints also are shown of this operation. That being the case I will feature this job more than the other operations named. The Equitable, as you all appreciate, is the largest office building in the United States. The cubic measurements show that plainly.

"Seven high-pressure boilers are installed in the basement and the engine room is some 32 ft. in the clear which gives ample height and takes care of the fitter's requirements, especially for the placement of the boilers.

"The pipes leading from these boilers supply 5000 direct radiators on 40 floors of this building and the riser sheet looks like a cut of a honeycomb radiator. The exhaust pipe alone rests on 15 ft. of concrete and is 30 in. in diameter. This pipe rests on this one block of concrete and extends to the 36th floor at which floor it is relieved to a certain extent and runs to the 40th floor on a self-supporting basis."

Mr. Driscoll answered many questions and it was late in the evening when the meeting adjourned.

St. Louis Chapter Hears Lecture on Manufacture of Pipe.

An address by J. V. Brunner, of the Reading Iron Company, on the methods used in the manufacture of wrought-iron pipe and charcoal-iron boiler tubes, was a feature of the May meeting of the St. Louis Chapter. The lecture was illustrated with moving pictures which covered the various processes from smelting the ore to loading the finished product on the cars. One of the chief points brought out was that the pure iron used was just as easily corroded as steel, but in the process of puddling, the molecules of iron were coated with slag or silicate. This coating, he said, becomes elongated in rolling, and under a microscope, a section of wrought-iron pipe resembles a rope composed of short fibres. While this reduces the tensile strength of the pipe probably about 10,000 lbs, as compared with steel, the factor of strength is so great that it is of little moment. When corrosion attacks steel pipe, the carbon in the steel hastens the oxidization, whereas with genuine wrought-iron pipe, when corrosion attacks the pipe, it destroys the iron exposed, but it cannot penetrate the coating of the adjoining particles of iron. Thus the destruction of the pipe is arrested.

Mr. Brunner also told of attempts to produce a mechanical puddling furnace and stated that there was a possibility of this becoming an accomplished fact. In that case, the price of genuine

wrought-iron pipe would be reduced to that of steel.

President Sodeman, in opening the meeting, called attention to the subject of "group heating of buildings" which will be discussed by all the chapters in the fall. It was also proposed to set aside a meeting for the discussion of gas burners and gas boilers.

The Committee on Research Fund Drive reported that the local organization of the Heating and Piping Contractors' National Association had donated $200.00 per year for five years towards the support of the society's Research Laboratory. This announcement was enthusiastically applauded, and the association given a rising vote of thanks.

Edwin S. Hallett, chairman of the chapter's chimney committee, reported that the work of the committee on the publication of the code was completed, and that it is now in the hands of the members.

Electrical Facts You Should Know.

A distinct contribution to the data on electric heating is made in a newly issued booklet received from the Scheeline Manufacturing Co., 76 Tehama St., San Francisco, Cal., and entitled "Electrical Facts You Should Know." The booklet discusses first "The How and Why of Electric Heating."

"It has been established experimentally," points out the circular, "that 1 ampere of current flowing for one hour through a conductor, the resistance of which is 1 ohm, will generate 3.412 B. T. U. Since 1 ampere flowing one hour through a resistance of 1 ohm equals 1 watt-hour, therefore 3.412 B. T. U. equals 1 watt-hour, or 3412 B. T. U. equals 1 killowatt hour."

A comparison is then made with coal as follows:

Based on 100% efficiency:

At $20.00 per ton, 1 c coal equals 14,000 B. T. U.

At $1.00 per 1000 cu. ft., 1 c gas equals 5500 B. T. U.

Survey of Simplification Needs To Be Conducted by American Engineering Standards Committee.

At the request of Secretary Herbert Hoover, of the Department of Commerce, the American Engineering Standards Committee will undertake at once a canvass to determine what simplification in manufactured products is most needed and most desirable. This canvass will be conducted through the engineering and technical bodies having representatives on the committee or cooperating in its work. The survey of simplification or standardization needs and possibilities will extend into almost every industry in America.

Application of Payments by Heating Company for Materials.

In an action to foreclose a mechanic's lien for material sold by a corporation to a heating company and used by the latter in the construction of the defendant's house, the defense was payment to the plaintiff by the heating company. The Minnesota Supreme Court held, L. J. Mueller Furnace Co. v. Burkhart, 182 N. W. 909, that when a debtor pays generally on a continuous account, neither debtor nor creditor making an application of the money, payments will be applied on the basis of priority, and the oldest debit item will be first paid; or, in other words, the law applies payments made on the first unpaid debit items. The plaintiff kept a loose-leaf ledger account with the heating company. It designated on the debit side the person for whose use the material furnished was intended. That used in the defendant's house was marked on the ledger account with the name of the job. Material was sold to the heating company for use in particular jobs. The credits were not applied. They variously appeared as "cash," "discount," or "credit memo." The credit items were considerably greater in amount than necessary to pay the heating company's debit for the material furnished for the defendant's house, and all prior debits. Applying the rule above stated, which controls when the parties make no application, the court held that the heating company paid the plaintiff for the material used in the defendant's house, and affirmed a judgment for the defendant.

National Association of Sheet Metal Contractors.

Adoption of the warm-air furnace code drawn up by a committee representing several associations of men connected with the heating industry was the feature of the eighteenth annual convention of the National Association of Sheet Metal Contractors which was held in Indianapolis, Indiana, May 16-19 last. A reservation, however, was adopted at the suggestion of the committee, to the effect that the code is of no value unless some provision is made for its enforcement.

In his address, the retiring president, A. P. Lamneck, called attention to a growing practice on the part of furnace manufacturers of establishing retail selling branches in all large centers of population. "Most manufacturers," he said, "are naturally inclined to do business with legitimate dealers, but because of the policy of their competitors, are compelled, as they see it, to install direct."

He thought this condition was due to the fact that the furnace dealer is not aggressive enough, that he has no set policy of selling or installing.

Mr. Lamneck called attention to the to specialize on the furnace business or quit it entirely, to use the same aggressive methods that the manufacturers are using, to adopt a credit plan if necessary for the use of the purchaser, never to install a furnace that will not give satisfactory service, and, finally, no matter what it costs, always to retain the good will of the purchaser.

Mr. Lamneck called attention for the campaign now being conducted for the use of copper roofing, stating that "if this roofing is what is claimed for it, and the price is not prohibitive, it will mean a great volume of business for the roofing contractors."

The new officers are: President, John A. Pierpont, Washington, D. C.; first vice-president, Frank B. Higgins, St. Louis (re-elected); second vice-president, George P. Werner, Galveston, Texas; third vice-president, David M. Haines, Chicago; fourth vice-president, Joseph C. Gardner, Indianapolis, Ind.; treasurer, Julius Gerock, Jr., St. Louis, Mo. (re-elected); secretary, Edwin L. Seabrook, Philadelphia, Pa. (re-elected); trustees (for three years) Arthur P. Lamneck, Columbus, O.; George Harms, Peoria, Ill.; and John H. Hussie, Omaha, Neb.

St. Louis was chosen as the 1923 convention city.

National Association of Master Plumbers.

A registration of 1287 men and 526 ladies was the high water mark established by the National Association of Master Plumber at its fortieth annual convention in Detroit, June 6-8.

Of almost equal importance to the convention itself, was the exhibit of heating and plumbing apparatus in the exhibit hall of the General Motors Building.

In his address, President Joseph W. Cannon told of the efforts that had been made to aid the local associations in their dealings with the journeymen. A service was instituted, he said, as a means of aiding members in securing journeymen to carry on plumbing operations in localities where labor troubles might exist. Upon the request of any State or local association, the national association is now prepared to send out a letter to all members and to every non-member on the mailing list, containing facts pertaining to the locality where the trouble exists. It asks all members and non-members to assist the local in need of workmen by sending the names and addresses of journeymen whom they know are competent and willing to work in accordance with the conditions as stated.

"Up to the present time," said President Cannon, "Forth Worth local association is the only one that has taken advantage of the offer."

An interesting resolution was brought before the convention relating to the elimination of the temperature guarantee clause in architects' specifications. After considerable discussion, it was decided to refer this resolution to the

general conference committee, with instructions to place the proposition before the conference committee of the Heating and Piping Contractors' National Association, and later, before the American Institute of Architects, in an effort to bring about the elimination of this clause.

John S. Irvine, of Detroit, was elected president. The other officers elected are: Vice-president, Samuel F. Wilson, Newark, N. J.; treasurer, Richard J. Welch, Lowell, Mass.; secretary, William Hughes, Detroit.

It was voted to hold the next convention in Atlantic City.

National Pipe and Supplies Association.

Guilford R. Adams, of Samuel Sloan & Co., Rochester, N. Y., was re-elected president of the National Pipe and Supplies Association at its thirteenth annual convention in Pittsburgh, May 16-17. The other officers are:

First vice-president, W. E. Clow, Jr., James B. Clow & Sons, Chicago, Ill.; second vice-president, L. J. Merkel, Merkel Brothers Co., Cincinnati, O.; secretary-treasurer, George D. McIlvaine, Pittsburgh, Pa.

Regarding business conditions, 206 firms reported that the average volume of business for the first four months of 1922 was 100.07% of that for the corresponding period in 1921, or practically the same.

Addresses were delivered by Dr. Charles Aubrey Eaton on "Statesmanship in Industry"; by James H. Tregoe, secretary-treasurer of the National Association of Credit Men, on "A Look Backward and a Glance Forward"; and by M. L. Seidman on "Taxes and Normal Business Conditions."

Some interesting percentages on cost of doing business and on profit were reported. The average cost without interest ran from 22.83% to 26.11%, while the average gross profit was 21.34%

Three Rules for Success in the Heating Business.

The full text of the three principal reasons designated by President N. Loring Danforth of the Heating and Piping Contractors' National Association as the most important elements in the success of the heating contractor are taken in full from his address at the recent meeting of this association in Buffalo:

1.—The head of the concern must have an intimate knowledge and mastery of every detail in the business. If the boss doesn't know himself, how can he tell someone under him how to do the job? He must keep up with the everchanging costs of material, and where estimates include work done by other trades to be subcontracted for, definite proposals should be obtained from these sub-trades instead of allowing someone in your own organization to estimate these subtrades, who is not properly qualified to make such an estimate.

2.—Obtain the confidence of your customers. There is no building industry about which the general public knows so little as the heating business. Their ignorance is appalling. They do not know the value of our materials, except relatively, by comparing lump sum bids for proposed work—they cannot tell the difference between good and poor workmanship, except as they can judge from the results obtained when the plant has been put in operation and few even know how to properly operate a plant when completed.

Can you not see, therefore, what a high premium we should place on obtaining the confidence of our customers? Give them good workmanship and good materials—guard that confidence and let nothing betray it. Put into the job what is specified—unless you can afford to buy something better—and as the years go by, you will be surprised at the reputation you have built up—at the repeat orders that will come in—or at the ease and comfort with which you will handle business, from former customers even though it has to come to you on a competitive basis.

3.—No one can succeed in business without a highly developed conscience keenly alive to a contract obligation, whether written or verbal—whether clearly expressed or reasonably implied—and that conscience must be relied upon to act equally toward the customer as well as toward the manufacturer supplying you with materials or the workmen who furnish the labor to build the job in place. Pay your bills when they become due. '30 days net—2 per cent cash in ten days'—should be lived up to you, just as you expect the owner to comply with the terms, 'Payments 90 per cent monthly as the work progresses—balance on the completion of the contract.' The replacement of defective materials by the manufacturer should be within the same limits as your guarantee to the owners, in other words, run an honest business. J. P. Morgan is responsible for the well known truth that banks loan more money on character than on financial statements.

Now—these three reasons—a knowledge of the business, the confidence of your customer—and a keen and honest conscience are not in themselves a complete receipt for a good financial statement at the end of the year. You cannot continue in business rendering good service to the customer— unless you can get a price for your work which will enable you to meet your overhead expense of doing business and leave you a fair profit for your own personal service and a return on the capital which you have invested. A man on the verge of bankruptcy finds it hard to be honest. The contractor who takes a job at cost is bound to skimp and twist and turn, to cut and quibble—until long before the work is finished, his organization has lost all enthusiasm, the contractor feels the owner has mistreated him, and the owner is fully confirmed in the thought he has always held—that contractors are a poor lot anyway and the steam fitter or plumber, as he is often miscalled, the worst of the lot.

How then can we reach the ideal condition which I have described—get a price for our work and be able to give the service. The solution of the problem lies in educating the trade through this organization and its affiliated local bodies. A prisoner in solitary confinement has no opportunity to cultivate a broad general outlook on life. Picture to yourselves the heating contractor bound by the four walls of his shop with its smell of dope and 'bronzing liquid,' tying himself to a straight path from home to work, to job, to architect for money—to bank for payroll—to the shop and home again; day in and day out, fighting his own problems in his own way without the help and experience of other men—denying interest in his local or National Trade Organization; pleading inability to pay dues, and lack of time to participate in their activities.

This man—this isolated unit, who believes in 'going it alone'—may think that he is a successful heating contractor—but the chances are that when he passes into that part of the hereafter apportioned to people who like solitary confinement, his business will pass with him, and his estate will find in the basement a few bull-headed tees, some solid dies and 4½-inch pipe fittings as basis for a possible 10 per cent distribution to his creditors.

Resolutions Adopted at Heating Contractors' Annual Convention.

Among the resolutions adopted during the executive sessions of the Heating and Piping Contractors' National Association in Buffalo, June 1-3, were the following:

A resolution endorsing the effort of the American Society of Mechanical Engineers to establish a safety code regarding unfired pressure vessels, and request the National Association to take similar action and cooperate in the movement on behalf of the members toward reducing or eliminating the hazards in connection therein.

A resolution endorsing the movement inaugurated by the American Engineering Standards Committee at the request of Secretary Hoover to determine what simplification in manufactured products is needed and to pledge the co-operation of the association in securing such simplification.

A resolution to have the board of directors devise a definite trade mark or slogan applicable and suitable to the heating and piping contracting industry for the identification of the association's members.

A resolution providing for the appointment by the president of a committee of five members to formulate a definite plan for employment and training of apprentices, which plan shall be

capable of modification to meet local conditions. It was further resolved that copies of such a plan should be placed in the hands of all the members with the request that they notify the headquarters office of any changes they find necessary or advisable to make in the form in order to have it operate effectually in their locality to the end that the form may be modified or adjusted to produce as nearly as possible any efficient apprenticeship system, for the stabilizing of the construction department of the industry.

Engineering and Economic Facts of the Coal Situation.

In connection with the present public interest in the coal situation, Acting Director E. A. Holbrook of the Bureau of Mines emphasizes certain engineering and economic facts that have been brought out from time to time by engineers of the bureau and others.

The costs, supplies and markets for anthracite (hard coal) should not be confused with those for bituminous (soft) coal. Mr. Holbrook points out. Anthracite is mined in northeastern Pennsylvania alone. The mining costs comparatively are high and the supply is used largely in the eastern States as a domestic and city fuel on account of the absence of dust and freedom from smoke. The bituminous coal produced in the remaining coal fields of the country is more cheaply mined, has more tendency to produce smoke during burning, and, in general, is the industrial fuel of the whole country and the domestic fuel of much of the country west of Ohio.

There has been practically no production of anthracite since April 1, and such of this coal as has been sold comes from stocks then on hand above ground.

Most of the production of bituminous coal at present is coming from West Virginia, Alabama, Kentucky, Tennessee and from scattered mines in western Pennsylvania.

The consumer who has been accustomed to buy coal from other and nearer mines must expect to pay a higher freight cost per ton for coal from these more distant mines.

The usual coal mine is a business operation in which the bulk of the product must be sold before it can be produced. It is still not commercially practicable to store great percentages of the coal output above ground to await a favorable market. Therefore, a coal operator who finds a customer or customers willing to contract to take 50% or 60% of his coal regularly for a year, often sells this coal at cost or perhaps below cost, as it enables him to keep his mine working, and he must therefore charge more per ton for the remainder of his coal sold without contract or as the so-called "spot coal."

The actual costs of blasting and loading the coal out of the mines may be somewhat more than one-half the cost of producing the coal. The rest of the operator's cost is for machinery, timber, power, pumping water, keeping the mine passages free from fallen rock, and the other overhead expenses incident to any business. Thus, the cost of mining a ton of coal is different for every mine in the country. A new modern mine operating full time on a favorable seam of coal may produce the coal for $2 per ton, or perhaps less, while with an older mine with long passageways to maintain, the cost may be up to $2.50 per ton. At other mines, where the coal bed is not so thick, the cost may be as much as $3, or possibly more. Costs are also affected by the degree of operation. With a normal $2.50 cost mine running to only 10% capacity it is possible for mining costs to go as high as $4 or $5 per ton.

Each decrease in the price per ton of coal closes the higher cost mines and reduces supply and thus prevents to an extent a surplus of coal. Each increase in the price of coal enables more mines to operate and thus brings more coal on the market. A comparatively small percentage of excess coal has generally caused a sharp decrease in price, a comparatively small deficiency a decided rise.

In general, much of the confusion in the public mind in regard to the production of coal comes from the facts that it is a diverse, great, and scattered industry. Conditions and facts for one district may be misleading when applied to another district. For each condition investigated, generalization should be made only after a careful study of many different districts.

Badge of Office for President of British Heating Engineers.

The accompanying illustration is a reproduction of the badge of office with which the retiring president of the (British) Institution of Heating and Ventilating Engineers, Frank Biggin, was invested during the annual meeting of the institution in London recently. The badge was designed by a committee of the institution and is based largely on a suggestion submitted by Alcwyn A. Jones. It represents the Greek God of Wind blowing, intended to be symbolical of ventilation. A Grecian altar is also shown, with a fire burning, representing heating, while in the background the sun sends forth its beneficent rays.

BADGE OF OFFICE FOR PRESIDENT OF BRITISH HEATING ENGINEERS.

The badge will be worn at the next meeting of the institution by the new president, A. H. Barker.

How Packless Radiator Valves Have Advanced The Science of Heating.

In the light of present knowledge, it is easy to see why the packless radiator valve has had such an important influence in the development of the art of heating. In fact, it has made so many improvements possible that manufacturers have made every effort to improve the valves and thus keep pace with the art itself. It is, of course, well known that constant research and experiment have been devoted to increasing the efficiency of packless radiator valves, and adjusting the packless features to meet the requirements.

So it has come about, that the packless valve has enabled heating engineers to introduce highly efficient vacuum-vapor heating systems and their effectiveness may be gauged from the increasing number and classes of buildings in which they are installed.

Many heating engineers fail to appreciate the value of the packless valve because they have not given sufficient thought to the importance of the inlet valve to a heating system. They will make sure that their boilers are in perfect condition, look over their radiators carefully, and make sure of proper setting, in fact, give minute attention very often to every part of the heating system except the type of valve used. We all know what an opposing element air is to a heating system, and how necessary it is to thoroughly expel such air from a system. It is equally important to keep air out of a system, and it is in this respect that the packless valve has its greatest usefulness.

In commenting on the situation, the Dole Valve Company, Chicago, Ill., manufacturers of the Dole packless radiator valve, makes the point that there are many otherwise efficient one-pipe steam systems in operation to-day that could be improved over 100%, and run with marked economy and less labor, by installing high-grade packless inlet valves and modern all metal thermostatic valves.

The Place of Service in Heating Work.

If there is one business more than another which should be ruled by service it is the business of the heating engineer. Unless the installation of heating equipment serves the customer, the labor and material put into the job are so much dead loss. Every employer and employee should radiate service. It should be so prominent that the public will come to think of the heating engineer as a real benefit to the community in which he lives.—C. R. Frost, *before Alberta Association of Sanitary and Heating Engineers.*

TYPES OF WATER SERVICE HEATERS

VII

Both instantaneous water-tube and storage steam-tube heaters have previously been illustrated and described in this series. In the design of the Wainright floating-head service heaters, to which this article is devoted, the manufacturers have proceeded on the ground that where storage capacity is essential to provide for large drafts of hot water exceeding the heating capacity of the source of steam available, the requirements are best met by the instantaneous type heater, used in connection with a separate storage tank.

To the advocates of instantaneous water heaters a matter of prime consideration is the relatively low heat transmission secured in steam tube heaters where gravity circulation of the water only is depended on to bring

FIG. 1—WAINWRIGHT VERTICAL TYPE "FB" FLOATING-HEAD SERVICE HEATER.

the cold water in contact with the hot steam tubes placed at the bottom of the storage tank. In such heaters, it is pointed out, the generally accepted figure for heat transmission is from 200 to 250 B. T. U. per square foot per hour per degree mean temperature difference.

With the instantaneous type water-tube heater, where the incoming supply pressure is used to force the water through the tubes or, by means of an "induction" tee fitting, to recirculate also the water which is coolest in the storage tank, in installations using an instantaneous heater with a separate tank, it is not uncommon for tests to show from 500 to 750 B. T. U. or even more transmitted per square foot of heating surface per hour per degree mean temperature difference. In other words, the instantaneous heater, as far as the necessary heating surface is concerned, is on this basis from two to four times as efficient as the steam-tube storage type.

ers with cast-iron shells in connection with separate steel storage tanks. This is the first cost which, it is stated, is frequently less than that of the combined storage tank and heater.

The Wainwright instantaneous service heaters, built by the Alberger Pump and Condenser Company of New York, are of the floating head type with tubes rigidly expanded into tube

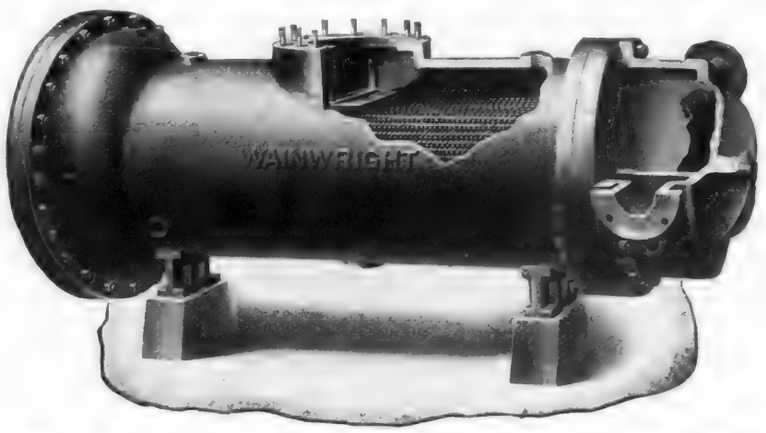


FIG. 2. WAINWRIGHT HORIZONTAL TYPE "FC" FLOATING HEAD SERVICE HEATER.

Another argument advanced by those favoring the instantaneous types of water heaters is based on the fact that storage-type heaters are generally built with steel (boiler plate) outer shell or tank, brass or copper tubes with cast-iron heads and fittings on the tubes. With this difference in metals, it is maintained, there is the necessity of meeting the condition of active electrolysis or galvanic action which in a few years may rust away the outer shell or tanks on such heaters. This galvanic action, of course, results most effectively and destructively at the high water temperatures prevailing.

There is another reason advanced by the instantaneous heater advocates for making use of instantaneous type heat-

heads, as illustrated, and are offered with smooth, seamless drawn-brass tubes where large volumes of water are to be heated through small temperature rise, or where the friction loss resulting from passage of water through the tubes must be kept to an extreme minimum. The Wainwright service heaters are also built with corrugated, seamless drawn pure electrolytic copper tubes where the maximum possible transmission per square foot of effective heating surface is sought. All these heaters have cast-iron shells.

The diagrammatic layout for instantaneous heater and storage tank for use in a steam laundry presents several interesting features different from the

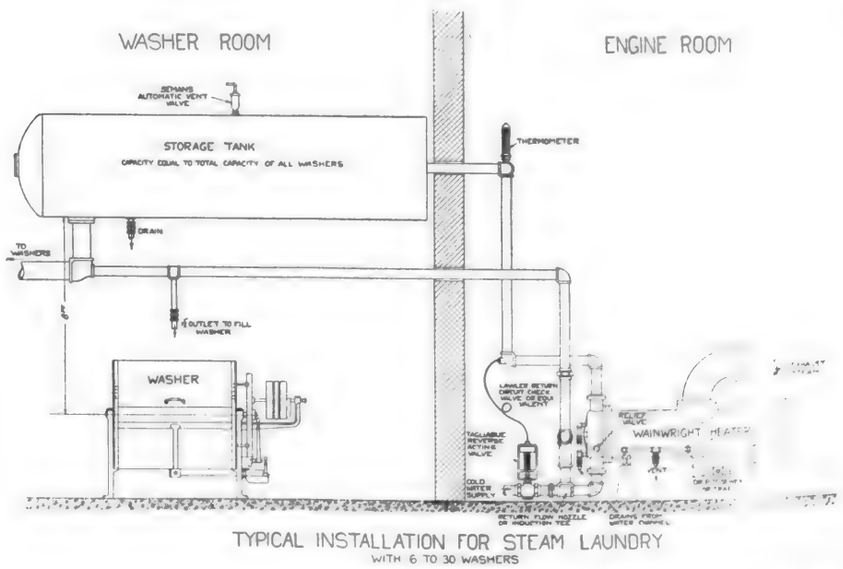


FIG. 3.—DIAGRAMMATIC LAYOUT FOR INSTANTANEOUS HEATER AND STORAGE TANK FOR STEAM LAUNDRY.

usual pressure tank installation in that the storage tank is under atmospheric pressure a portion of the time. Assume the system being filled, i. e., cold water supply being turned on in the morning. Then the incoming water passes through the heater and passes the thermostatic bulb in the outlet pipe from the heater and which is connected with a Tagliabue reverse-acting valve (Fig. 3). If the water is not as hot as the regulator has been adjusted for, the reverse-acting valve will partly close until the quantity of water passing through the heater is automatically regulated to be delivered at the desired temperature into the storage tank, which it enters easily as the tank is vented at the top with a Semans automatic (float) vent valve. When the tank has been filled, the vent valve closes but opens to atmosphere to permit large draughts of water to be withdrawn to fill the washers quickly. Meanwhile the water in the tank may have lost a few degrees by radiation, so on the next filling, which takes place automatically, a portion of the coldest water is recirculated through the heater by means of the return flow nozzle or "Induction" tee shown in the illustration.

Photographic reproductions of the Wainwright heaters are also shown. These are offered in either horizontal or vertical designs to best suit the customer's requirements in the matter of available floor space and piping arrangements.

Notably large installations of Wainwright instantaneous floating-head service heaters have been made in the Hotel Biltmore, New York City, and in the Drake Hotel, Chicago.

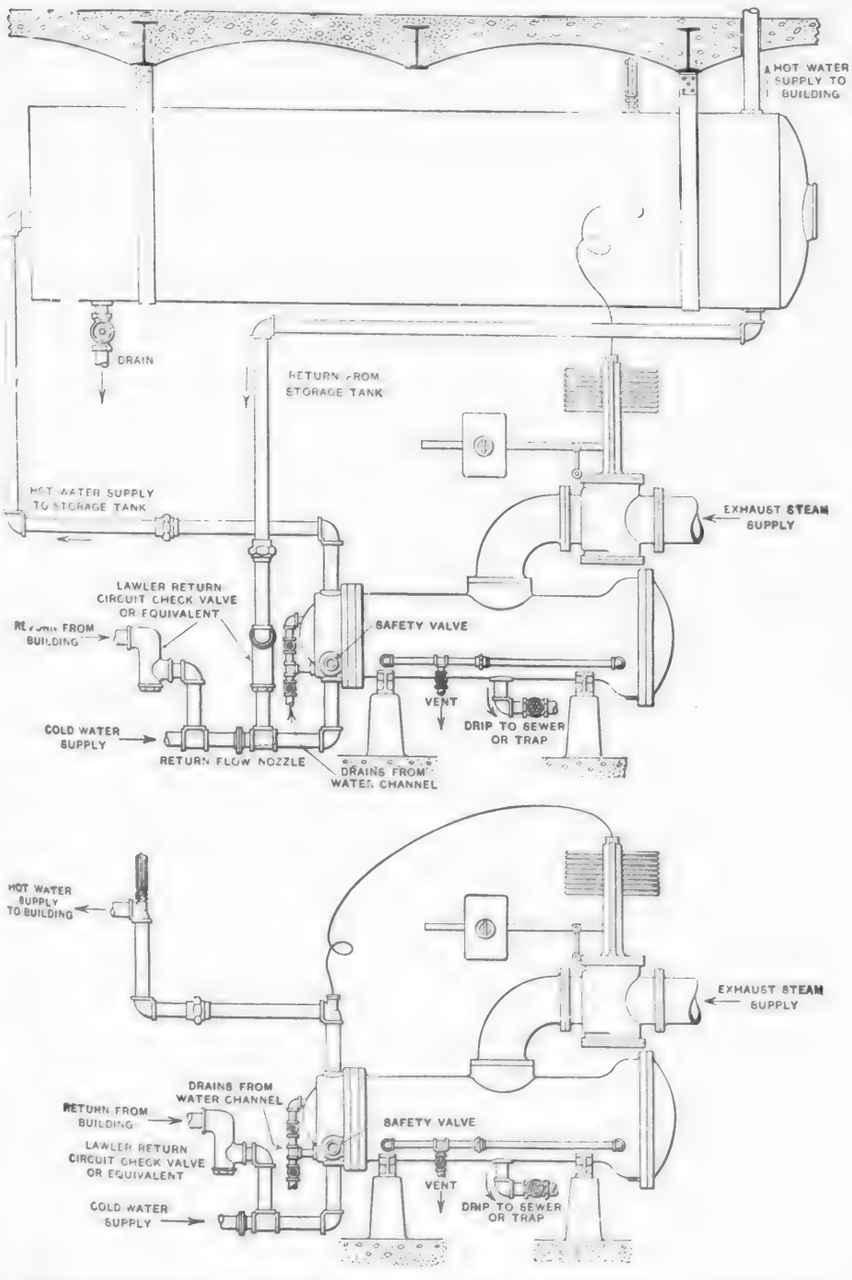


FIG. 4—APPROVED METHODS OF INSTALLING WAINWRIGHT FLOATING-HEAD SERVICE HEATERS, BOTH WITH AND WITHOUT A STORAGE TANK, WITH TEMPERATURE REGULATOR.

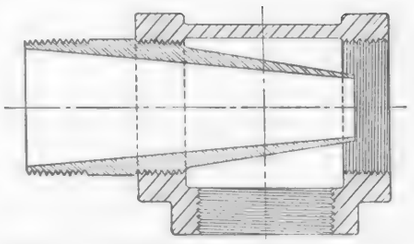


FIG 5.—RETURN-FLOW NOZZLE OR INDUCTION TEE.

A New Work on Steam Heating.

A data book for engineers, dealing exclusively with steam heating, has just been brought out by Warren Webster & Co., Camden, N. J., under the title of "Steam Heating." It is an impressive volume of 368 pages, 8 x 10½ in., and includes 162 tables of useful data and 493 typical layouts and illustrations.

"Steam Heating," it is stated, has been prepared by the technical staff of Warren Webster & Company and is intended to be of particular use in the designing room, since special care has been given to the preparation of tables and charts for the selection of the proper sizes and quantities.

As is natural whenever definite problems are discussed, Webster systems are dealt with in the solutions and several chapters are devoted to descriptions, dimensions and ratings of Webster heating specialties. On account of the cost of the work which is intended to occupy a place in the heating field similar to that of "Steam" in the power field, there is a nominal cost of $3.25 for the book which is delivered postpaid at that price.

Included in the contents are chapters on elements of steam heating, data required for steam heating system design, heat transmission tables, a discussion of air infiltration, method of calculating heater requirements, method of computing and selecting heating surface, ventilation problems as they affect heating system design, proportioning of chimneys, selection of boilers, selection of proper type of heating system, flow of low-pressure steam through piping, critical velocities in radiator runouts, vacuum pump and auxiliary equipment, laboratory tests of return traps, systems of steam heating, installation detail diagrams for the modulation and vacuum systems, together with many pages containing miscellaneous information.

Ozone as used in connection with air washers is the subject of a circular letter issued by the Ozone Air Purifier Co., Chicago, Ill., together with the report of a test made by the E. Vernon Hill Company on two New York City installations, one in the Bank of Montreal, where the air is ozonized, and the other in the Elks Club, where air not ozonized is used. An analysis of two water samples taken from the air washers in the two buildings was strikingly in favor of the ozonized air installation, especially in the matter of bacteria which was apparently reduced by the ozone to almost nothing, while in the other case it ran up to 23,000 per c. c.

PORTABLE UNIT FAN BLAST HEATERS

1—The Baetz Heater.

In beginning, with this article, descriptions of the various types of portable unit fan blast heaters, which have assumed an important place in the heating and ventilating field during recent years, an effort will be made to give the reader an adequate conception of their capabilities and the uses to which they are especially suited. The descriptions will follow the order of dealing first with the so-called portable unit heaters, as distinguished from the portable unit ventilators. The articles on the unit ventilators will follow in due course.

It should be pointed out that these articles are intended to be informative only. In this, as in all engineering matters, the facts are what is desired and it will then be an easy matter for the engineers to determine for themselves how far they may go in making use of these units.

One of the most prominent types of unit fan blast heaters to figure in the present development of this line of apparatus is the Baetz heater, designed by Henry Baetz and manufactured by Skinner Bros. Mfg. Co., Inc., of St. Louis, Mo. In commenting upon unit heaters in general and upon the Baetz type in particular, Mr. Baetz makes the point that "if you intend in these articles to cover the method of heating now so popular whereby spaces measuring hundreds of feet in length and width are warmed by one heater without using distributing ducts, then we are inclined to think the reader may be misled by the term, 'portable unit heaters,' and may wrongly assume that the method of heating without distributing ducts, and a portable unit heater, are one and the same thing."

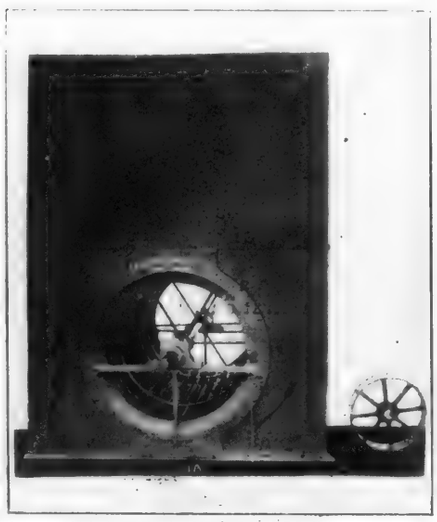


FIG. 1.—BAETZ PATENT AIR HEATER, WITH MULTIVANE FAN.

"Every heater," continues Mr. Baetz, "where steam coil and fan are on the same base is obviously a portable one and also a 'unit' heater. This general type of heater in several forms has been in use ever since the fan or hot blast system of heating began and that reaches back half a century. Always during that long stretch distributing pipes and ducts have been indispensable adjuncts of the fan system of heating, and all heaters, among them many that were portable units, had to be piped up with the more or less intricate network of distributing pipes to obtain a distribution.

"The newer method dispenses with ducts and pipes and an even distribution of warmth throughout even the largest spaces is obtained with the use of only a single heater, often set in some out-of-the-way spot, almost invisible.

"This innovation in heating methods is possessed of distinct characteristics that place it in a class by itself. As a distinct system it differs as widely from the fan or hot blast system as does the direct radiation method. The older method seeks to bring about a distribution of warmth by dividing the hot air delivery from the fan heater into numerous small streams and carrying these long distances through pipes and liberating the heated air into the room atmosphere in the form of scattered jets. The newer method has no carrying pipes at all and relies on its specially-designed fan heater, working in harmony with natural laws, to obtain delivery of warmth to the remotest corners of the largest spaces. In this method, while the fan heater is a portable one and also a self-contained unit, it requires additional features for successful operation and whoever attempts to obtain an even distribution in a large space by relying on a heater that has nothing more to recommend it than 'unit' and 'portable' is doomed to disappointment when cold weather comes around.

"The difference in process and result between the method of using distributing pipes and the one without can be understood by observing the behavior of a body of quiescent liquid in a circular vessel when an ordinary thin pencil is inserted into it and turned about steadily in one direction. The entire body gets into harmonious motion. This is exactly what happens to the atmosphere in a large space with the method of no pipe when the proper kind of heater is used—the upper strata of the higher temperature air are forced away from the heater towards the outer walls, while the cooler floor air is being drawn back into the heater.

On the other hand, take that same liquid body in its quiescent state and move a pencil back and forth or crisscross and the main body of liquid is not affected at all Only the parts immediately in contact with the pencil are disturbed and that is what takes place with the atmosphere of a large room when widely-spread-about distributing ducts are relied upon. It is therefore obvious that not merely heat to warm the room is required, but a distinctive movement of the atmosphere must also be imparted by the heater.

"The uniformity of movement of the entire atmospheric mass inside the room has not only brought about a revolution in warming industrial plants and large spaces but has accomplished great things in the removal of steam vapors and their resultant drippings in paper mills, dyeing plants, and packing houses.

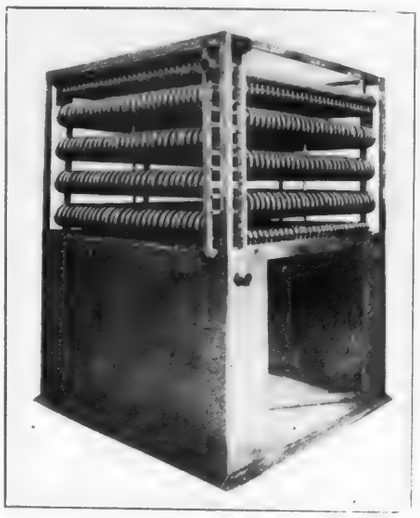


FIG. 2.—ARRANGEMENT OF HEATING COILS IN BAETZ PATENT AIR HEATER SHOWING RACK CONSTRUCTION.

"Quite a good many years ago the first Baetz patent air heater was built and installed in an industrial plant and that marked the beginning of this still modern method of mechanical or fan heating without the use of distributing ducts.

"The Baetz heater has exclusive features which, we maintain, have been proved to be indispensable for the success of this heating method and for which purpose they were primarily designed. The photographic views of the heater which accompany this article show the large, free, open spaces between the steam coils that permit of an easy flow of air in contact with the heating surface and this has a direct effect upon the air movement of the room.

"The crisscrossing of the sections that constitute the heating coils is designed to deliver a maximum of heating units from the steam coils into the passing air. This manner of arranging the coils provides a comparatively short distance from where the steam enters each individual coil to where it connects with the bottom header, insuring a maximum efficiency. Besides this, the arrangement shown permits the easy removal of either section by unscrewing the right and left nipple at the top header and a corresponding one from the lower header and then

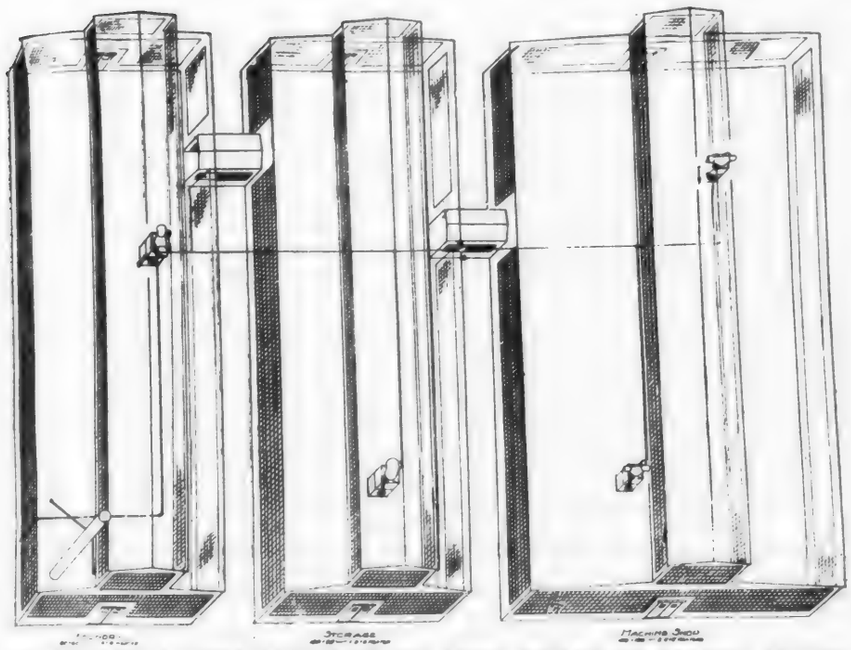


FIG. 3. TYPICAL INSTALLATION OF THE BAETZ PATENT AIR HEATING SYSTEM IN THREE ONE-STORY BUILDINGS PRACTICALLY ALL GLASS EXCEPT THE ROOF.

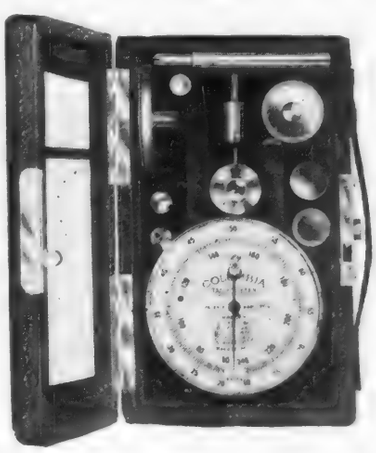
withdrawing the individual section. The manner here shown of arranging the coils makes possible the use of a greater amount of heating surface on a given floor space than in any other form. In modern plants where floor space is valuable this feature is of considerable consequence.

"Since the peculiar and distinctive movement of the room atmosphere is indispensable to the success of the method, the type of fan which delivers the air becomes a matter of importance. The cut shows the multivane type of fan which is conceded to have the maximum of capacity for air movement. This type is standard equipment for the Baetz heater."

New Apparatus and Appliances

A New Hand Tachometer.

Columbia Hand Tachometer, designed for general industrial work, with a five-speed range, is a new instrument which has been brought out by the



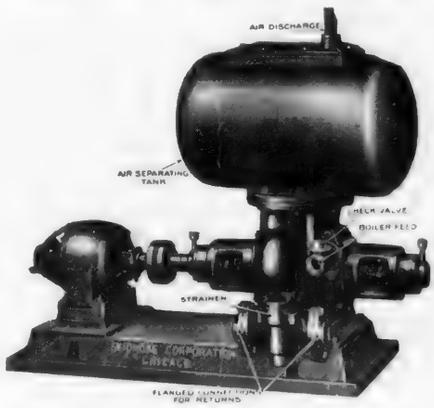
COLUMBIA HAND TACHOMETER.

Schaefer & Budenberg Mfg. Co., Brooklyn, N. Y. The ratio of minimum to maximum dial graduation is 1 to 400, covering all speeds encountered in industrial practices. There are two standard ranges, one range from 20 up to 8000 R. P. M. and one range from 40 to 16,000 R. P. M. Each range is sub-divided into five sub-ranges, each of which is immediately accessible by turning the shift button. The instrument is unusually compact, fitting the hand conveniently. Its weight is 13 oz. The dial is graduated individually by hand from a master tachometer. Both the graduation and sub-dividing lines are engraved on a 3-in. ivory-finished dial, making it easy to read. A patented feature of the instrument is its oiling system which is similar in design to that used in high-grade magnetos.

Judging from the report recently made public by the Committee on Elimination of Waste in Industry of the American Federated Engineering Council, there are plenty of plants which could benefit from the use of such an instrument. In this report it was stated that one of the principal reasons for low production was the fact that a large percentage of the manufacturers are operating at only 50% efficiency.

A New Hydro-Turbine Vacuum and Boiler-Feed Pump.

A novel application of the liquid piston idea has been made in a new vacuum and boiler-feed pump which has been brought out by the Skidmore Corporation, 1535 Dayton Street, Chicago, Ill., under the name of the Skidmore hydro-turbine vacuum and low-pressure boiler-feed pump. While all hydro-turbine air pumps use slugs of water which are caused to pass through the rotor passages by centrifugal force, this pump, it is pointed out, does not flatten the water slugs or impart centrifugal force to them, due to the fact

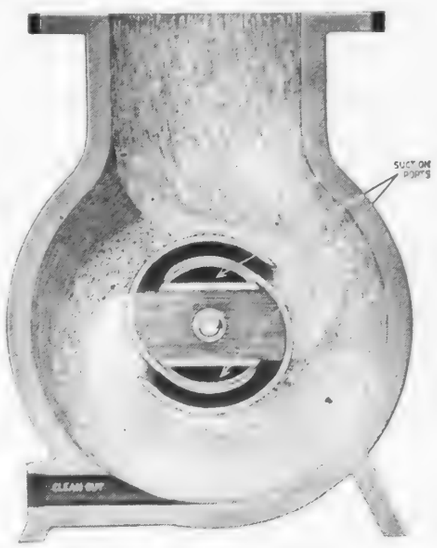


SKIDMORE HYDRO-TURBINE VACUUM AND LOW-PRESSURE BOILER-FEED PUMP.

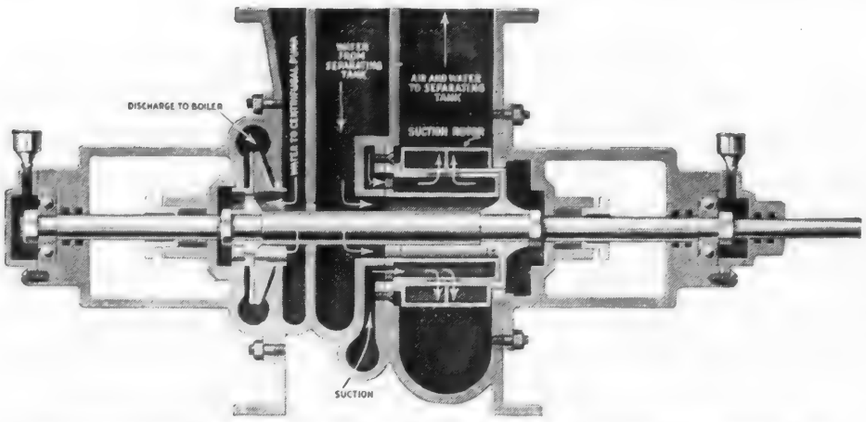
that the passages in the rotor are concentric. The pump relies entirely for its operation on the water piston remaining quiescent long enough for the passages to pass in relation thereto, that is, instead of the piston moving and the cylinder remaining stationary, the piston remains stationary and the cylinder moves. In this way, it is stated, perfect balance and structural refinements make it possible to greatly increase the pump's efficiency.

The separating tank is bolted directly on the pump casing. A combined strainer and check valve is flanged direct to the pump suction, and flange openings are provided on both sides for convenience in connecting returns from the heating system. The sediment basket is arranged so that it may be easily removed for cleaning without disturbing the piping.

The suction intake is close to the



OPERATING PRINCIPLE OF THE SKIDMORE BOILER FEED PUMP



CROSS-SECTION OF SKIDMORE BOILER-FEED PUMP, SHOWING OPERATION.

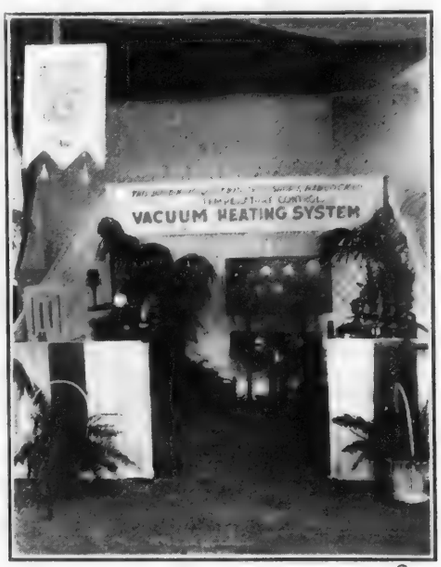
floor which acts to reduce the lift on the water of condensation to a minimum from returns on or below the floor level. This feature, it is stated, enables the Skidmore pump to operate with greater efficiency where high lifts are necessary.

The air, vapors and waters of condensation are delivered by suction rotor to the separating tank from which water flows by gravity to the centrifugal pump, the air and vapors passing off through the air discharge. The inlet to the centrifugal pump is at a certain height so that a sufficient water level for sealing is maintained in the tank at all times.

To prevent any loss of water through the air discharge pipe at times when the pump is not in operation, (as closed down for the night) a float valve is installed, so that it will automatically close the air discharge before water fills the tank. This valve has another function as in case the boiler pressure increases above the pressure at which the centrifugal pump is designed to operate, water will accumulate in the tank closing the air discharge; when this occurs the suction rotor automatically becomes a booster to the centrifugal pump enabling it to deliver the water against greater boiler pressure.

As all air vapors and water are handled by the suction rotor, the same as a piston pump handles them, a separating tank open to the atmosphere is used, thereby saving power.

A vacuum is maintained on the system at all times and all water is returned to the boiler or feed-water tank, as the case may be.



BISHOP AND BABCOCK COMPANY
(Temperature Control)

Deaths.

GEORGE H. REYNOLDS, formerly secretary and one of the founders of the Heating and Piping Contractors' National Association, died in Chicago, June 5, two days after the close of the heating contractors' recent convention in Buffalo when resolutions of sympathy were sent to him on his sick-bed. He was 83 years old. Mr. Reynolds was for many years in the heating contracted business in Chicago and retired about fifteen years ago.

H. GILBERT HART, founder and president of the Hart & Crouse Co., Utica, N. Y., died at his home, Hart's Hill, Whitesboro, N. Y., June 12. Many of the older men in the heating industry knew Mr. Hart personally as he had travelled extensively from coast to coast in the interests of his company. Mr. Hart established what is now the Hart & Crouse Company in 1882. It was at first known as the H. Gilbert Hart Company, and was one of the earliest manufacturers of warm-air furnaces in the country. After its re-incorporation the company added its line of cast-iron heating boilers to its products. This was the beginning of the well-known Royal heating boilers which are still widely used throughout the country. Mr. Hart is survived by his widow and three sons, two of whom are members of the Hart & Crouse organization.

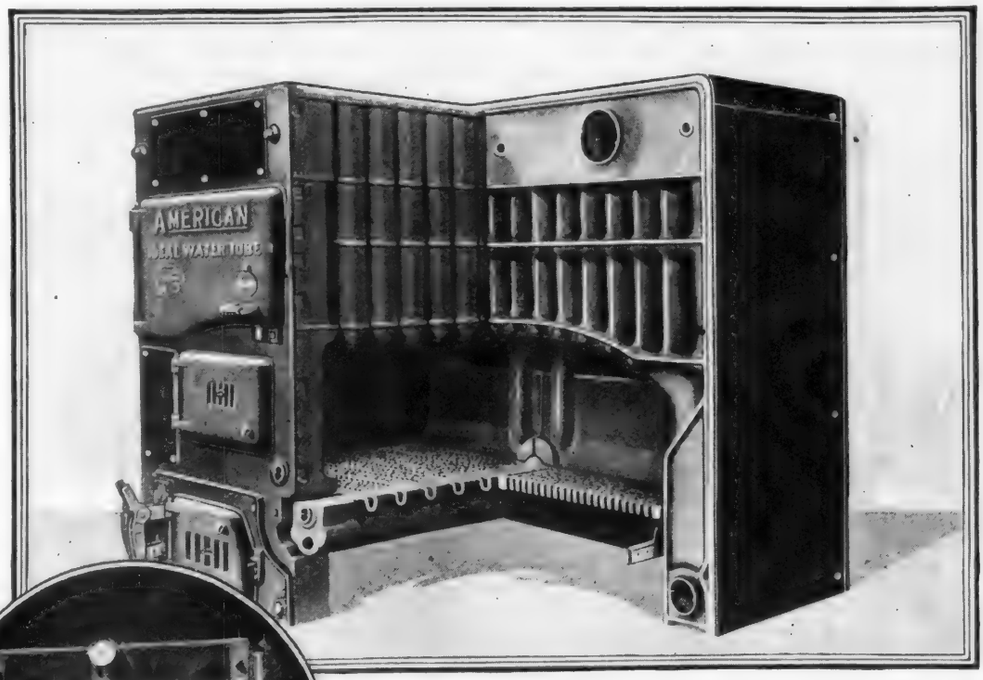
JAMES ROBERTSON, president of Thomas Robertson & Co., Montreal, Canada, died at his home in that city, following an illness which confined him to his bed since last November. Mr. Robertson was born in Glasgow in 1855. In 1871 he entered the firm established by his father, Thomas Robertson and only a year ago celebrated the 50th anniversary of his connection with the company. He was well known among Montreal's leading business men.

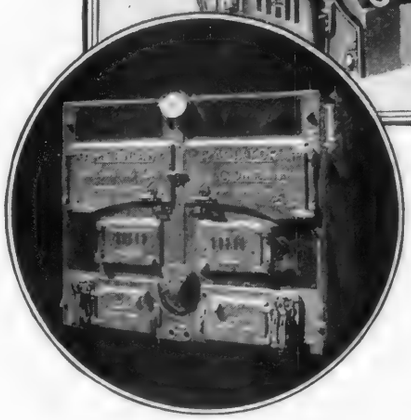
J. WALTER SILK AND CLARENCE SILK, members of the heating and plumbing firm of J. W. Silk & Sons, Bar Harbor, Me., were both drowned in an accident which occurred at Bar Harbor, May 22.

EVER-HOT HEATER COMPANY.

BISHOP & BABCOCK COMPANY.

ADDITIONAL EXHIBITS AT CLEVELAND'S AMERICAN BUILDING EXPOSITION.





BUILT
like a bridge!

THE UNUSUAL DESIGN of the IDEAL 79 inch Water Tube Boiler is well shown in the cut-away view above.

Notice the bridge-like construction of the sections. No separate base is required; the weight of each section is self-supported by a substantial girder-like water-leg extending to the floor, which absorbs a large portion of the radiant heat below the grate, and forms an air-tight, water cooled ash-pit.

The boiler is assembled in two separate halves, connected in the rear by single flow and return headers. Each half section has a cast-iron conical nipple connection at the top and bottom.

This unusual construction allows absolute *free* expansion and contraction, not only within each section, but of the entire boiler. All danger of strain at high firing periods is completely eliminated.

The wide, shallow fire box is made possible by the water-filled grate support in the center. This means easy and efficient firing. It also means easy shaking—for notice that the grates are in two sections, with two separate shaker-handles to each section to give plenty of leverage.

Designed especially for heavy-duty work, the IDEAL 79 inch Water Tube Boiler, assembled either singly or in batteries, has practically unlimited capacity for heating large buildings.

HAVE YOU its specifications and ratings in your files? Just send to either address below for our illustrated booklet containing full details.

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

104 West 42nd St., New York Dept. 106 816 So. Michigan Ave., Chicago

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING

Heating - Steam -
18" Brick Wall Lath furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	2	2	2	2	900	68	86	77	72
40	3	4	3	3	920	69	88	79	74
60	5	6	5	5	940	71	90	81	76
80	6	8	7	6	960	72	92	83	78
100	8	10	9	8	980	74	94	84	79
120	9	11	10	10	1000	75	95	85	80
140	11	13	12	11	1020	77	97	87	82
160	12	15	14	13	1040	78	99	89	84
180	14	17	15	14	1060	80	101	91	86
200	15	19	17	16	1080	81	103	93	87
220	17	21	19	18	1100	83	105	94	88
240	18	23	20	19	1120	84	107	96	90
260	20	25	22	21	1140	86	109	98	92
280	21	27	24	22	1160	88	111	100	94
300	23	29	26	24	1180	89	113	101	95
320	24	30	27	26	1200	90	114	102	96
340	26	32	29	27	1220	92	116	104	98
360	27	34	31	29	1240	93	118	106	100
380	29	36	32	30	1260	95	120	108	102
400	30	38	34	32	1280	96	122	110	103
420	32	40	36	34	1300	98	124	111	104
440	33	42	37	35	1320	99	126	113	106
460	35	44	39	37	1340	101	128	115	108
480	36	46	41	38	1360	102	130	117	110
500	38	48	43	40	1380	104	132	118	111
520	39	50	44	42	1400	105	133	119	112
540	41	51	46	43	1420	107	135	121	114
560	42	53	48	45	1440	108	137	123	116
580	44	55	49	46	1460	110	139	125	118
600	45	57	51	48	1480	111	141	127	119
620	47	59	53	50	1500	113	143	128	120
640	48	61	54	52	1520	114	145	130	122
660	50	63	56	54	1540	116	147	132	124
680	51	65	58	55	1560	118	149	134	126
700	53	67	60	56	1580	119	151	136	127
720	54	69	62	58	1600	120	152	136	128
740	56	71	64	60	1620	122	154	138	130
760	58	73	66	62	1640	123	156	140	132
780	59	75	67	63	1660	125	158	142	134
800	60	76	68	64	1680	126	160	144	135
820	62	78	70	66	1700	128	162	145	136
840	63	80	72	68	1720	129	164	147	138
860	65	82	74	70	1740	131	166	149	140
880	66	84	76	71	1760	132	168	151	142

R.A.C.

RADIATION COMPUTING—Steam Heating, 18-in. Brick Walls. | NO. 13-K

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING

Heating - Steam -

21" Brick Wall Lath furring and plaster on inside

Net Exp. Wall	Direct Radiation				Net Exp. Wall	Direct Radiation			
	S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.		S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	1	2	2	2	900	63	76	72	68
40	3	3	3	3	20	64	78	74	69
60	4	5	5	5	40	66	80	76	70
80	6	7	6	6	60	68	82	77	72
100	7	9	8	8	80	69	84	79	74
120	8	10	10	9	1000	70	86	80	75
140	10	12	11	11	1020	71	86	82	77
160	11	14	13	12	1040	73	88	83	78
180	13	15	14	14	1060	75	90	86	80
200	14	17	16	15	1080	76	92	87	81
220	15	19	18	17	1100	77	93	88	82
240	17	20	19	18	1120	78	96	90	84
260	18	22	21	20	1140	80	97	91	85
280	20	24	22	21	1160	82	99	93	86
300	21	26	24	23	1180	83	101	95	88
320	22	27	26	24	1200	84	102	96	90
340	24	29	27	26	1220	86	104	98	92
360	25	31	29	27	1240	87	106	99	93
380	27	32	30	29	1260	89	108	101	95
400	28	34	32	30	1280	90	109	103	96
420	29	36	34	32	1300	91	110	104	97
440	31	37	35	33	1320	92	112	106	99
460	32	39	37	35	1340	94	114	107	101
480	34	41	38	36	1360	96	116	109	102
500	35	43	40	38	1380	97	118	111	104
520	36	44	42	39	1400	98	119	112	105
540	38	46	43	41	1420	99	121	114	107
560	39	48	45	42	1440	101	123	115	108
580	41	49	46	44	1460	103	125	117	110
600	42	51	48	45	1480	104	126	119	111
620	43	53	50	47	1500	105	121	124	112
640	45	55	52	48	1520	106	129	122	114
660	47	57	53	49	1540	108	131	123	115
680	48	58	55	50	1560	119	133	125	117
700	49	59	56	52	1580	111	135	127	119
720	50	60	58	54	1600	112	136	128	120
740	51	62	59	55	1620	113	138	130	122
760	53	64	61	57	1640	115	140	131	123
780	55	66	63	58	1660	117	142	133	125
800	56	69	64	60	1680	118	143	135	126
820	57	70	66	62	1700	119	144	136	127
840	59	72	67	63	1720	120	146	138	129
860	61	74	69	65	1740	122	148	139	130
880	62	75	71	66	1760	124	150	141	131

P.M.C.

RADIATOR COMPUTING—Steam Heating, 21-in. Brick Walls. | NO. 13-L

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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING

The Illinois System

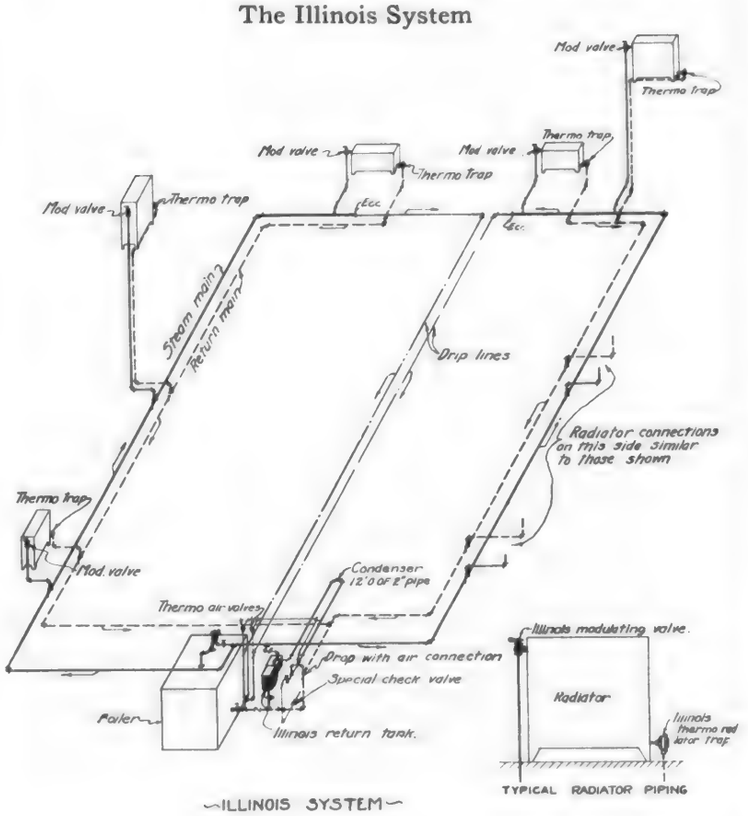

FIG. 1.

The Illinois Vapor system has been developed by the Illinois Engineering Company, Chicago, Ill., one of the pioneers in this field. It can be or is operated below atmospheric pressure for hours at a time, but is also to be classed as a modulating system, the radiators being equipped with quick-opening supply valves (Fig. 2) which gives a range from full steam to no steam on a half turn of the handle.

The Illinois system includes specialties or appliances which are designed to take care of any condition of pressure or vacuum which are possible in a low-pressure heating system. These include a return trap (Fig. 3) which operates automatically to put the water of condensation back into the boiler, regardless of the boiler pressure, up to a limit of 10 lbs. pressure, the limit of low pressure heating boilers.

All of the radiators are equipped with the Illinois Thermo trap (Fig. 4) which discharges the air and condensation into the return mains which run to the return trap. Quick heating up of the system is made possible by the Thermo trap which provides a 5/16-in. air outlet on each radiator.

The air vent from the return trap, which also acts as an air-liberating tank, is provided with an air vent seal valve which is described as the result of twelve years' experience with this type of heating system. It permits the air to be vented from the system on 2 or 3 oz. of pressure. Care must be taken in its use to see that it prevents the air from pulling back into the system when the pressure in the system falls below atmospheric pressure—that is, when the system is operated as a vapor system.

The ends of the steam mains are dripped into a separate wet return which is carried back to the boiler without passing through the return trap. In the arrangement of overhead supply systems, an Illinois vent seal valve is usually placed at the high point on the supply mains.

(Continued on Data Sheet No. 132-LL)

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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING

The Illinois System

(Concluded from Data Sheet No. 132-KK)

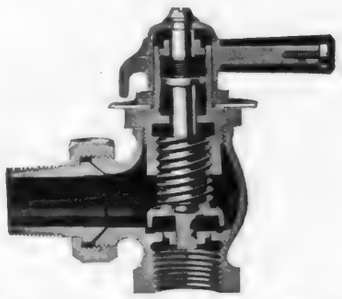

FIG. 2.—ILLINOIS THERMO MODULATING VALVE

Sizes, Capacities of Illinois Modulating Valves

SIZE In. Dia.	Capacity Sq. Ft. Direct Radiation	C Inlet to Face In.	C Tail-piece to Face In.	Wt. Lbs
¾	100	2⅝	1⅜	2
1	200	3⅛	1-9/16	2¾
1¼	275	3½	1¾	4½
1½	400	4	2	4¾

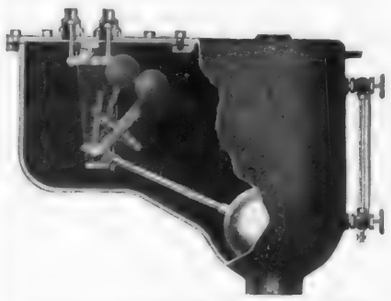

FIG. 3.—ILLINOIS RETURN TRAP.

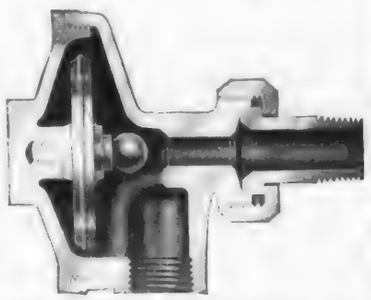

FIG. 4. ILLINOIS THERMO RADIATOR TRAP

Sizes, Capacities, Dimensions of Illinois Thermo Radiator Trap

SIZE In. Diam.	Capacity Sq. Ft. Direct Radiation	Pipe Connections In. Diam.	WEIGHT Lbs.	Center Outlet to end of Spud, In.	Center Spud to Face of Outlet In.
½ (Junior)	75	½	2½	2½	1[illegible]
¾	500	[illegible]	[illegible]	2[illegible]	2 7/16
1	1500	1	17	1[illegible]	[illegible]
1½ (Standard)	200	1½	3	2½	1[illegible]

PIPE SIZES—RADIATOR TAPPINGS

MAINS			RISERS			Horizontal Supply Branches Mains to Risers		Horizontal Return Branches Mains to Risers	
Supply	Radiation	Return	Supply	Radiation	Return	Supply	Radiation	Return	Radiation
2"	400 sq. ft.	1[illegible]	[illegible]	40 sq. ft.	[illegible]	[illegible]	20 sq. ft.	[illegible]	60 sq. ft.
2[illegible]	700 "	1[illegible]	1"	80 "	1[illegible]	1"	60 "	1"	350 "
3"	1,250 "	1[illegible]	1[illegible]	150 "	1"	1[illegible]	110 "	1[illegible]	1,700 "
3[illegible]	2,000 "	1[illegible]	1[illegible]	220 "	1[illegible]	1[illegible]	160 "		
4"	3,000 "	2"	2"	500 "	1[illegible]	2"	400 "		
4[illegible]	4,300 "	2[illegible]	[illegible]	990 "	1[illegible]	2[illegible]	700 "		
5"	5,600 "	2[illegible]	3"	1,500 "	1[illegible]	3"	1,100 "		
6"	9,000 "	3"	[illegible]	2100 "	1[illegible]	3[illegible]	1,800 "		
7"	14,000 "	[illegible]							
8"	19,000 "	4							

Tappings for Radiators
¾"x¾" up to 100 sq. ft.
1 "x1" up to 150 sq. ft.
1¼"x1¼" over 200 sq. ft.

VAPOR HEATING—The Illinois System (Concl'd) No. 132-LL

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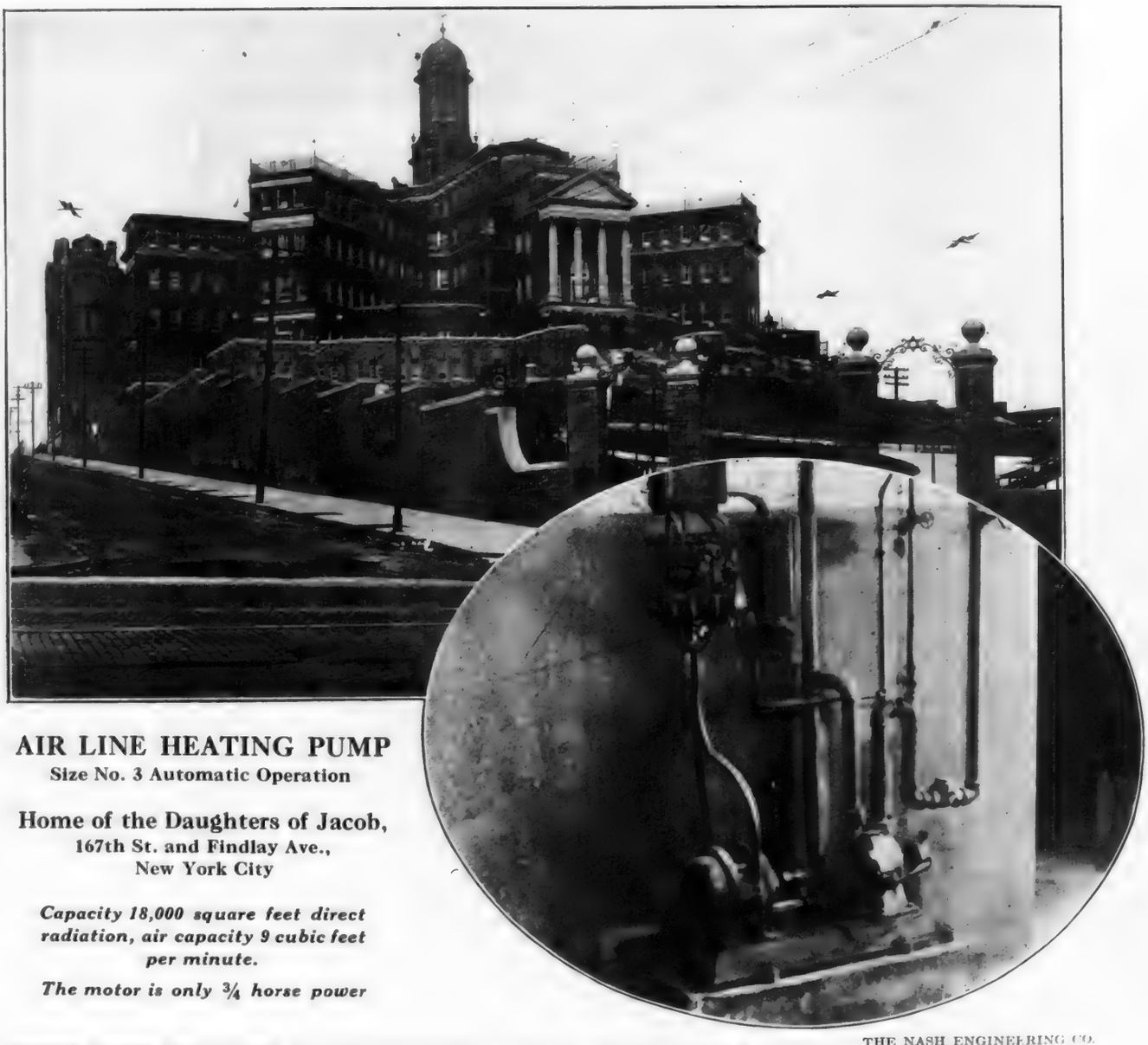
EFFICIENT HEATING
demands the JENNINGS PUMP



AIR LINE HEATING PUMP
Size No. 3 Automatic Operation

Home of the Daughters of Jacob,
167th St. and Findlay Ave.,
New York City

Capacity 18,000 square feet direct radiation, air capacity 9 cubic feet per minute.

The motor is only ¾ horse power

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty percent. In other words, the cost of current to operate is cut in half.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

Quiet, reliable operation without annoyance because of shut downs, and minimum of expense for repairs, is assured i the Jennings Hytor Vacuum Heating Pump is installed on your Vacuum Heating System.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 15 gives them in detail Write for it.

THE NASH ENGINEERING CO.
Plant and General Offices
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CHICAGO—1220 Monadnock Block
CLEVELAND—326 Frankfort Ave., N. W.
DALLAS—Dallas Bank Building
DENVER—Boston Building
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SEATTLE—220 Railway Exchange
ST. LOUIS—Chemical Building
TOLEDO—No. 1-9 St. Clair Street
TORONTO—Kent Building
WASHINGTON—710 14th Street, N. W.

The NASH ENGINEERING COMPANY
SOUTH NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

Heating and Piping Contractors' Philadelphia Association, at its recent annual meeting, elected Harry G. Black, of P. Gormly Co., Inc., as president. The other new officers are: Vice-president, A. C. Edgar; secretary-treasurer, M. G. Sellers; executive committee: J. Howard Hutchinson, Stewart A. Jellett, William M. Anderson and M. G. Sellers.

Atlantic City, N. J.—The first annual Builders' Exposition will be held in Atlantic City, September 8-15. The show will occupy a part of the Million Dollar Pier. Among the features will be a complete $10,000 bungalow which will contain a wide variety of furnishing and electrical devices.

San Francisco, Cal.—An item in the San Francisco Chronicle states that construction will begin soon in San Francisco on a testing plant for an invention by which it may be possible to convert heating pipes in homes and buildings into distributors for process-cooled air for the summer months. The invention, for which patents have been recently granted, will permit a temperature of 70° F. to be maintained in the hottest regions. The inventor is Willard Wilson Brown, manager of Feather River Inn, of Blairsden. According to a description of the invention, small streams of air are sent through a refrigerating fluid in a cooling tank, coming out of the fluid cooled and cleansed, to be distributed through the pipes of the heating system. Moisture in the cooled air is removed by passing the air through a layer of oil on the fluid's surface.

National Electric Light Association, at its 45th annual convention, in Atlantic City, May 16, heard an interesting report on fuel conditions which were discussed in detail in the report of the Prime Movers Committee, H. P. Liversedge, chairman. The United States must begin to look abroad for petroleum supplies, this report states, exhaustion of American petroleum resources being probable in comparatively few years. The greatest potential foreign source of supply, it points out, is Mexico. Every possible effort to eliminate waste in production and transmission is urged. Fuel production of electric power in the United States is almost twice as great as water power production, the report declares, adding that coal furnished almost nine-tenths of the power produced by fuel last year. The committee reviewed efforts made to develop new fuel supplies. Encouraging tests have been made with peat in Minnesota, and there are better prospects of making wider use of lignite coal, the report declares.

Morton, Ill., is reaping the benefits of the discovery of several natural gas beds which underly the city. There is one gas sand at about a 60-ft. depth and another sand, with a much stronger flow, at 160 ft.

Chicago (Ill.) Post reports that a certain manufacturer, on account of the unhealthful and harmful manufacturing processes in his plant he was forced to cover each of his workmen with $3,000 compensation insurance. As rapidly as broken health incapacitated a worker, another had to be hired to replace him. This was expensive, to say nothing of being disastrous and inhuman in its effect on the men. The manufacturer

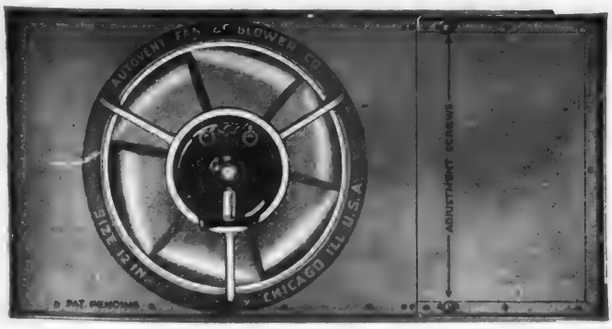
THE AUTOVENT WINDOW VENTILATOR

For Residence Kitchens, Homes and Offices

Costs Less Than One Cent per Hour to Operate

Housewives have been perpetually endeavoring to purchase a reasonably priced kitchen ventilator to remove all damaging cooking odors and excessive heat from their homes.

Are You Securing Your Share of this Profitable Business?



The above illustration shows the minute adjustment feature and the ease with which the Autovent Window Ventilator can be installed

ASIDE FROM THESE NUMEROUS SALES POSSIBILITIES

Millions of small offices are troubled with a contaminated air problem and are taking steps to overcome these handicaps. Now is the time to concentrate upon them. The Autovent Window Ventilator is the ideal solution of their problems and your opportunity.

Write at once for full particulars—It will pay you

AUTOVENT FAN & BLOWER CO.

Formerly BATTERMAN-TRUITT CO.

730 West Monroe St. Branch Offices in Principal Cities CHICAGO, ILL.

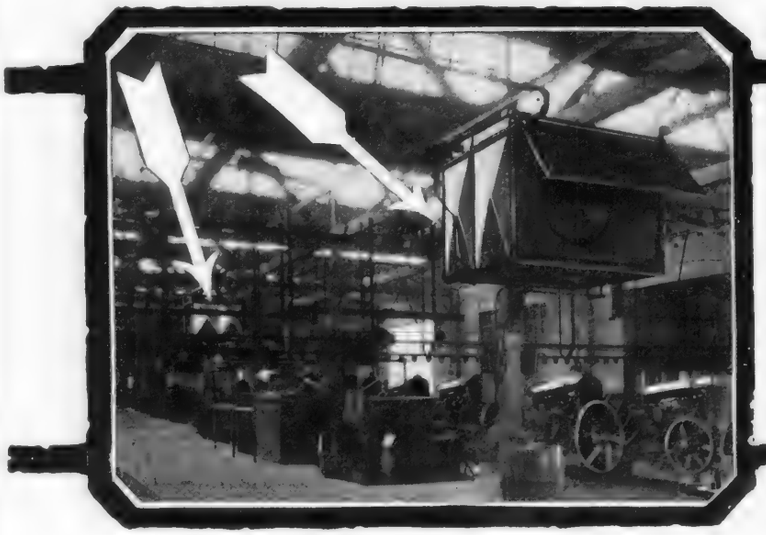
found that the low productive capacity per man, combined with the fixed excessive charge of breaking in new help, was inflating the cost of production to a point where it would soon become prohibitive. One day a solution presented itself. A means of introducing fresh air in quantity sufficient to insure health to the worker was found and installed. By maintaining a constant flow of pure, fresh air from the outside into the manufacturing rooms, a steady and healthy class of workers today supplants the old flow of transients departing with broken health. Employes' liability insurance premiums have been reduced and manufacturing costs materially lessened.

Chicago, Ill.—Another effort to pass a heating ordinance in Chicago has advanced to the point where the council sub-committee on health has voted for an ordinance calling for 60° F. at 6:30 A. M.; 65° F. at 7:30 A. M.; and 63° F. at 8:00 A. M. The 68° of heat must be maintained throughout the day and night until 10:30 P. M.

Des Moines, Ia.—Installation of a waste heat boiler system to convert into heat and power the gases which are now discharged into the air is nearing completion at the Hawkeye Cement Company's plant in Des Moines. Besides effecting a fuel saving, the new system is expected to eliminate the black smoke nuisance. In the rearrangement of the plant heat from the kilns will be delivered to the boilers, instead of passing up the stacks unused. It is estimated that enough steam will be thus produced to run the company's power plant. Three boilers, each with a heating surface of 6385 sq. ft., are being installed. They are of the Edgemoor type. The estimated cost of the changes is $350,000.

Central Supply Association, at its summer meeting in Chicago, June 14, discussed a proposal that instead of holding three meetings a year, the association meet in the Winter and Fall, each meeting to consist of a two-days' session, in place of a one day's session three times a year. Among the speakers were Frederick Walker, of the Library Bureau, Inc., who gave an illustrated talk on "Perpetual Inventory and Stock Record"; Professor Harold G. Moulton, of the Department of Economics of the University of Chicago, who spoke on "The Business Outlook"; and William J. Wool-

—To The Man Who is Interested In More Heat for Less Money ···

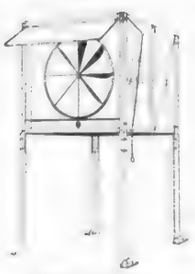


Ford Tractor Plant, Detroit, Michigan

When a mammoth organization like the Ford Tractor Plant makes three installations of ILGAIR Unit Heaters totaling 54 units, it represents an endorsement of one of this country's foremost Industrial plant engineers.

A Valuable Book *for* Architects and Heating Engineers *about* ILGAIR Unit Heaters

Sent on Request



Floor Type
Note Ceiling Type in Picture

HIGH EFFICIENCY ILG VENTILATING MACHINERY

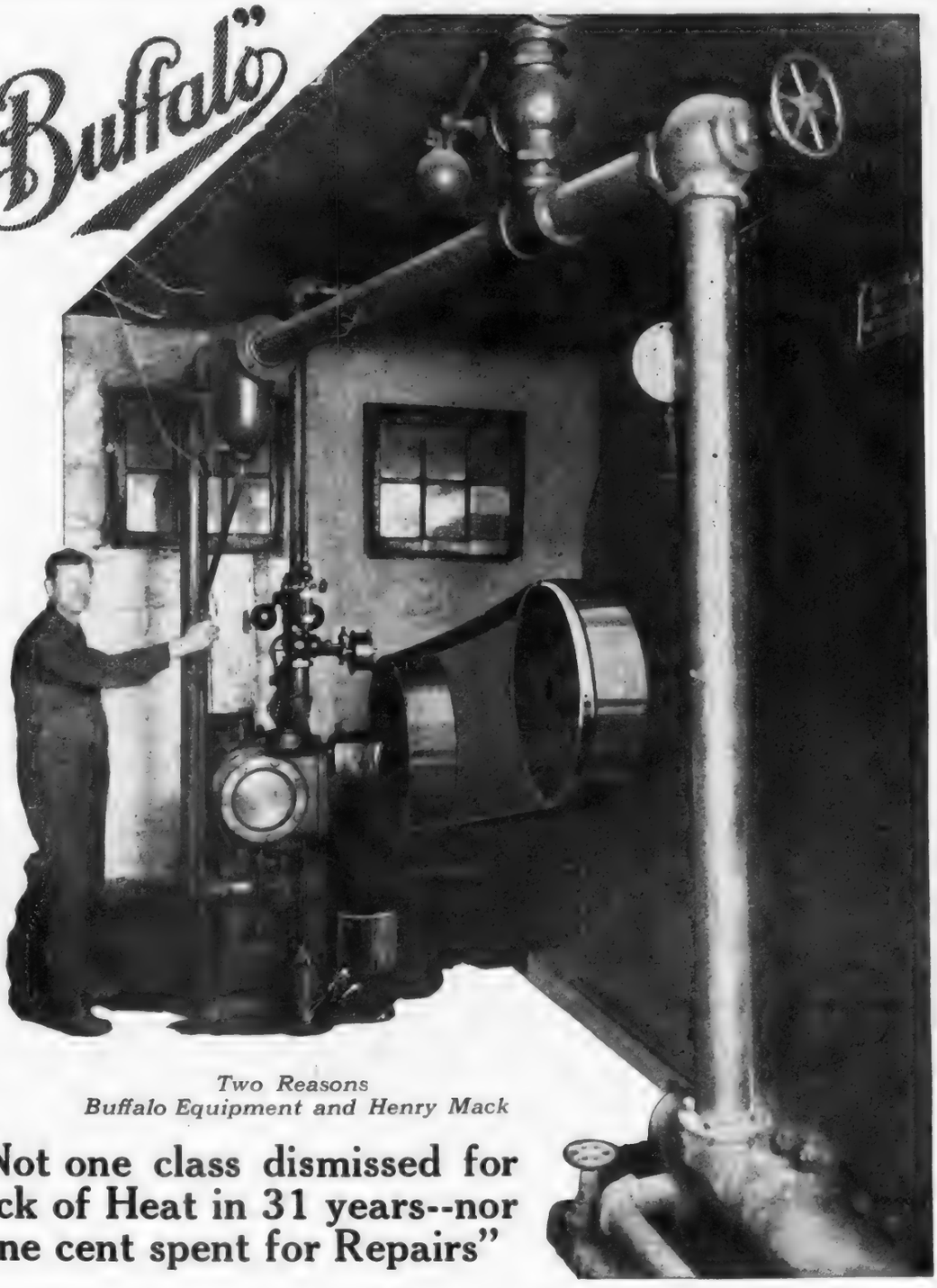
Ventilation

FOR OFFICES · STORES · FACTORIES · PUBLIC BUILDINGS · RESTAURANTS · THEATRES · HOUSES · ETC ·

ILG ELECTRIC VENTILATING CO. 2858 NORTH CRAWFORD AVE. CHICAGO

BRANCHES IN ALL PRINCIPAL CITIES

"Buffalo"



Two Reasons
Buffalo Equipment and Henry Mack

"Not one class dismissed for lack of Heat in 31 years--nor one cent spent for Repairs"

It is nothing unusal for us to hear of Buffalo Ventilating Fans and Engines that have been in use for thirty odd years but seldom are they under the charge of one man as has been the case in the Roosevelt School, Canton, Ohio.

Mr. Mack makes, and the school offiicials agree to the quoted statement above.

Mr. Mack's community can well be proud of him and his remarkable record of fidelity and efficiency.

We are proud of Buffalo Equipment and would appreciate an opportunity to tell you more about it.

Send for Catalog No. 36

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

ley, manager of the National Trade Extension Bureau. The annual meeting of the association will be held in Chicago in October.

First National Industrial Conference, which included an industrial advertising exhibit, was held in Milwaukee, Wis., June 11-15, 1922. Among the more important topics discussed were: Advertising as a factor in inter-industrial marketing, cutting the cost of distribution or marketing and its relation to industrial development, advertising in relation to the four points of contact in industry, advertising the technical product to the non-technical buyer, selling to the professional man in industry (by J. C. McQuiston, manager of the Department of Publicity, Westinghouse Electric & Mfg. Company), putting ideas into industrial advertising. One of the most interesting items on the program was a round-table discussion of advertising in its relation to inter-industrial marketing. The chairman of the conference was Keith J. Evans, advertising manager for Jos. T. Ryerson & Son, Chicago, while the exhibit committee was headed by Russell T. Gray, of Chicago.

Chamber of Commerce of the United States announces the election of Julius H. Barnes, of Duluth, Minn., as president. The other officers are: Vice-president (for the eastern States) A. C. Bedford, New York; (for the northern States) Thomas E. Wilson, Chicago; (for the southern States) Harry A. Black, Galveston, Texas; (for the western States) Thomas B. Stearns, Denver, Colo.; treasurer, John Joy Edson, Washington, D. C.

William J. Merten, metallurgical engineer of the Westinghouse Electric & Mfg. Co., has been elected vice-chairman of the Pittsburgh Chapter, American Society for Steel Treating.

American Institute of Chemical Engineers held its fourteenth semi-annual meeting at Niagara Falls, Can., June 19-21.

New York.—As a part of a nation-wide campaign designed to foster the use of more permanent materials in building, the Copper and Brass Research Association has announced a contest for school children and others, offering cash prizes for the best photographs showing the relative durability of materials which go into the construction of American homes.

Washington, D. C.—Plans for the erection in Washington of a $1,300,000 building as the home of the National Academy of Sciences and the National Research Council have been announced by Dr. C. L. Walcott, president of the National Academy of Sciences. The building is the gift of the Carnegie Foundation of New York. It is expected to be completed by a year from next Fall.

American Gas Association, New York City, announces that its headquarters are now located on the eighteenth floor of the Canadian Pacific Building, 342 Madison Avenue, New York.

Building Permits for April, 1922 showed an increase of 38%, the figures for 197 cities, as reported by the *American Contractor*, being $212,735,607, as compared with $153,068,232 for April, 1921. New York City, however, reported a drop from the previous month of $65,000,000. Statistics prepared by the F. W. Dodge Company show contracts awarded totaling $353,161,900 for April. Of this amount, $132,477,800 was for residence building.

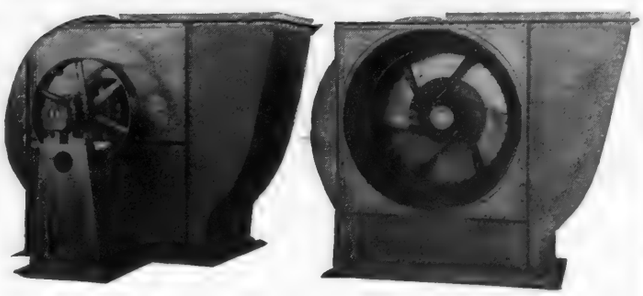
Theodore Weinshank, of the heating engineering firm of Weinshank & Fenstermaker, Indianapolis, Ind., has returned from a trip to Russia.

Boston, Mass.—A plan to build a 1200-room Statler hotel in Boston is reported as the result of a visit of E. M. Statler, of Buffalo, to Boston recently. One of the sites which is being considered for the new hotel is the Motor Mart in Park Square, which contains about 50,000 sq. ft. of land and is owned by the Jordan estate. The other is the lot back of the Paine Furniture Company Building, between Stuart Street and St. James Avenue, in the Copley Square District, consisting of about 100,000 sq. ft. of land.

J. Irvine Lyle, treasurer and general manager of the Carrier Engineering Corporation, Newark, N. J., sailed for England with Mrs. Lyle, June 17. Mr. Lyle will visit France, Belgium and Germany during his stay abroad.

LEHIGH

MULTIBLADE FANS



WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

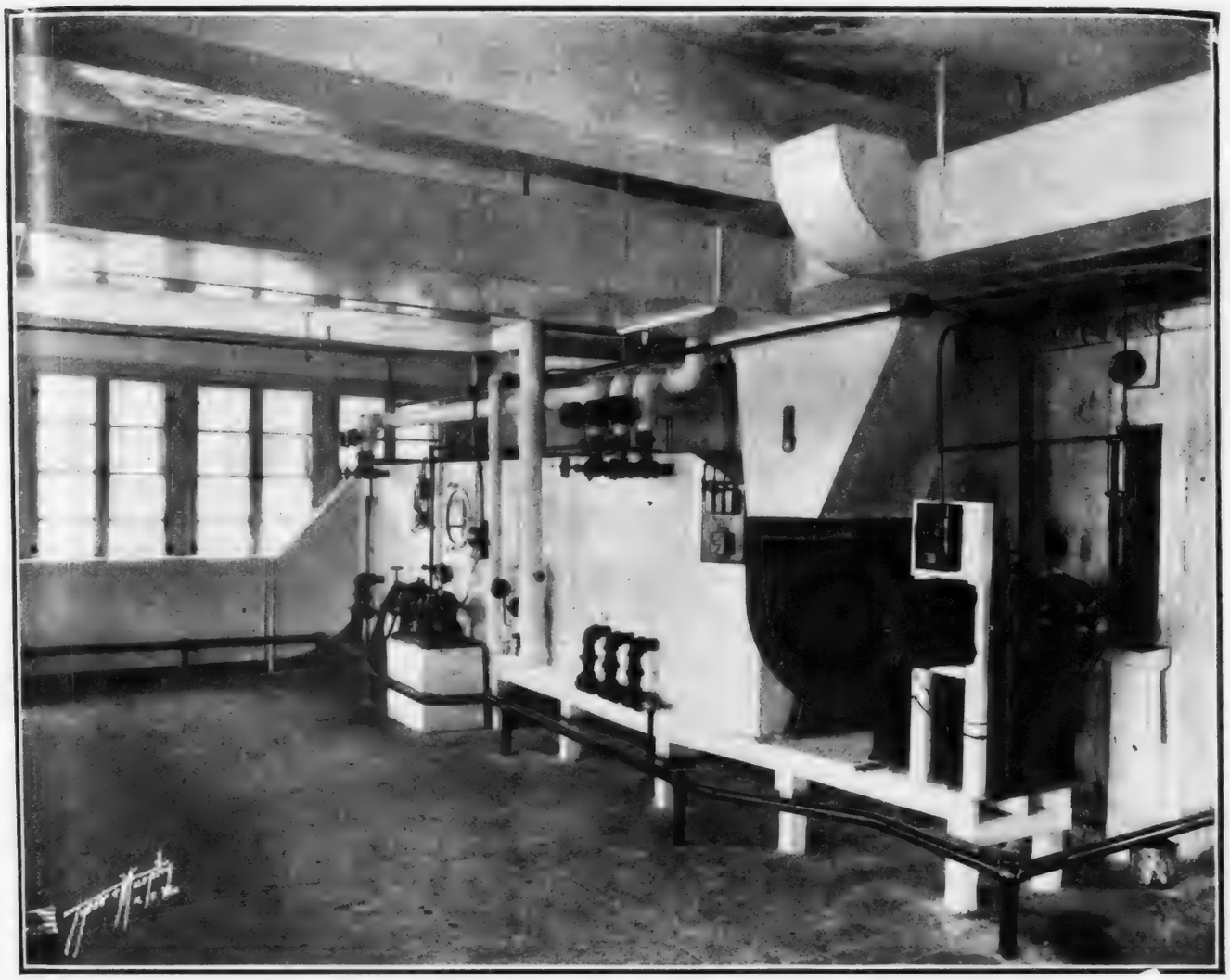
A study of the capacity tables and characteristic curves in the Lehigh catalogue clearly proves this fact.

To further substantiate this statement, your attention is directed to the large inlet and outlet, the cone shaped hub, the absence of stay-rods, the rigid construction secured by special blades running tangent from the hub to the periphery of the wheel and also various other details.

May we send you a copy of our catalogue?

HERSH BROTHERS CO.

654 Mill Street ALLENTOWN, PA.



"Sirocco" Products for Heating And Ventilating

The experience gained in the manufacture of a wide variety of equipment designed especially for heating and ventilating service enables the American Blower Company to furnish fans, air washers and steam trap systems that have demonstrated their worth in actual service over a long period of years.

May we not send you our bulletins describing "Sirocco" Products especially adaptable for heating and ventilating service?

AMERICAN BLOWER COMPANY. DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

An installation showing a "Sirocco" Motor Driven Fan, "Sirocco" Air Washer and Heating Coils.

(116)

"Sirocco" Products

TRADE MARK

BLOWERS · EXHAUSTERS · VENTILATING FANS · AIR WASHERS · ENGINES

FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Manufacturers' Notes.

Bishop & Babcock Co., Cleveland, O., has appointed the E. Vernon Hill Co., Chicago, Ill., as its western representative, for the sale of the company's line of temperature control devices. The territory covered by the western agency will include Chicago, Minneapolis, Duluth and Kansas City.

Fulton Co., Knoxville, Tenn., manufacturer of the Sylphon line of heating specialties, including valves and temperature control appliances, has been reorganized. Mr. Brown, the former treasurer, has disposed of his stock in the company to W. M. Fulton and Warren Webster Co., of Camden, N. J., and has retired from the company. The new officers are: President and treasurer, W. M. Fulton; vice-president, Warren Webster; executive manager, C. N. Mynderse; secretary, Henry Hudson. The company states that it proposes to continually extend and improve its service and in this connection has just issued a new catalogue containing much useful information on Sylphon specialties. This is the first general catalogue the company has published and it is a part of the company's direct-selling plan recently adopted in place of its previous policy of selling through a general distributing agency.

W. D. Cashin & Co., Boston, Mass., manufacturers' agent, announces the opening of a New York office in the Grand Central Terminal, Room 5613, as a sales agency for the Thermograde Valve Company, and for the Bishop & Babcock Company vacuum heating specialties. Thomas M. Kellogg has been appointed manager of the New York office.

Burnham Boiler Corporation, Irvington, N. Y., has opened a branch office in Philadelphia, at 1716 Sansom Street. H. M. Grossman is in charge.

United States Radiator Corporation, Detroit, Mich., has prepared plans for a one-story building, 80 x 172 ft., on Frisby Street, Baltimore, Md., to be occupied as its Baltimore branch. The building will cost $27,000.

Iron Products Corporation, New York, and its subsidiaries, the Central Foundry Co., Central Iron and Coal Co., Central Radiator Co. and Molby Boiler Co., announce the opening of a district sales office in Birmingham, Ala., in the Jefferson County Bank Building. The manager of the Birmingham office is T. C. Hyde, who will be under the direction of J. L. Brierton, vice-president and general manager of the Central Iron and Coal Company. Mr. Hyde will continue the sale of Universal pipe in the southern territory which he handled from the Central Foundry Company's Atlanta office, now discontinued. W. Z. Reynolds, whose headquarters have heretofore been in Chattanooga, will continue, from the new office, the sale of Tuscaloosa and Warrior pig irons, Holt foundry and furnace coke, and other products of the Central Iron and Coal Company. Hewitt Thompson, who is well known to the heating and plumbing trade in the Birmingham district, will sell Radio open fireplace water radiators, Radex magazine-feed downdraft boilers (steam and water) for small houses, and other heating and plumbing specialties of the Central Foundry Company and the Central Radiator Company. The Iron Products Corporation has a substantial interest in the Birmingham district where its subsidiaries, the Central Foundry Company and the Central Iron Company, have several millions of dollars invested.

Herbert Boiler Co., Chicago, Ill., has appointed Paul J. Purcell as one of the company's representatives in Chicago for the sale of the Herbert line of boilers and garbage burners. Mr. Purcell was formerly connected with the Standard Sanitary Mfg. Company and the Autovent Fan & Blower Company.

Herman Nelson Corporation, Moline, Ill., manufacturer of heating and ventilating equipment, has established four new sales offices as follows:

H. & P. Sales Co., St. Louis, which represents the Herman Nelson Corporation, has established a branch office in Kansas City, Mo., at 1104 Republic Building. F. P. Hitchcock, formerly with the United States Radiator Corporation, is in charge.

A Cleveland branch office has been established at 2036 East 105th Street, Cleveland, under the management of L. H. Williams, formerly with the Na-

ALLEN AIR-TURBINE VENTILATOR

Standard of Ventilating Efficiency

Wherever ventilation is desired—in factories, foundries, stores, schools, hotels, churches, theatres, residences, kitchens, bakeries, tanneries, barns, stables, garages, chimneys, air shafts, or wherever air circulation is required, Allen Air-Turbines *have proven the best, cheapest and most efficient* ventilating system known.

Many of America's largest architects, engineers and industrial concerns have adopted and endorse Allen Air-Turbine Ventilators.

Patented

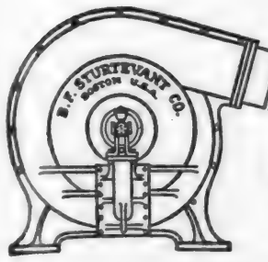
Diameter of Pipe	Air Displacement Cu. Ft. per Hour	
	Wind Velocity 4 Miles per Hour	Wind Velocity 8 Miles per Hour
8 Inches	17,300	21,600
10 "	26,500	32,500
12 "	38,600	46,200
15 "	54,000	69,000
18 "	85,200	102,100
20 "	105,100	125,600
24 "	149,000	185,000
30 "	225,000	272,000
36 "	281,000	330,000
42 "	324,000	414,000
48 "	360,000	473,000

Our air displacement is measurable and the figures given are guaranteed to be correct.

CARRIES OFF
GASES
MOISTURE
STEAM
SMOKE
VAPOR
FOUL AIR
ODORS
HEAT
FUMES
DUST
DAMPNESS

Write for Detailed Literature

ALLEN AIR-TURBINE VENTILATOR CO.
DETROIT Eighth and Porter Sts. **MICHIGAN**



Sturtevant

REG. U.S. PAT. OFF.

PUTS AIR TO WORK

Irvine & Meier, Contractors — Malcomson, Higginbotham & Palmer, Architects — McColl, Snyder & McLain, Engineers

Pattingill School, Detroit, Michigan

In Detroit

This million-dollar building is said to be the finest and most completely equipped school in the country.

So wide is its reputation that school architects and school authorities from many other cities are visiting this building with a view to putting similar equipment in their new schools.

Naturally, in such buildings of this character Sturtevant apparatus is used throughout.

Our engineers will be glad to co-operate with you in making your buildings equally well known for the excellence of their equipment.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

692

tional Radiator Company.

A Denver branch office has been opened with T. R. Stoltenberg in charge. Mail may be addressed to P. O. Box 1168, Denver, Colo.

A branch has been established in Spokane, Wash., at 110 West Augusta Avenue. R. L. Nelson is in charge.

The Herman Nelson Corporation has also transferred George P. Smith, formerly manager of the Salt Lake City office, to its Chicago office.

Kewanee Boiler Co., Kewanee, Ill., celebrated the 30th anniversary of its organization May 1. Of the original directors of the company, which included E. E. Baker, Horton Vail, T. P. Pierce, August Wagner and J. P. Dugger, the only surviving member is Mr. Baker, president of the company. Another interesting fact brought out in connection with the anniversary is that 23 of the men who were with the company when it started are still members of the organization. These men are: E. E. Baker, B. F. Baker, M. F. Moore, H. D. Cherry, George Daniels, Ned Mitten, Sel. Millett, Adolph Lindburg, John Bergquist, Andrew Mooney Alfred Watts, Dan. Moore, Al. Stinson, Bion Derr, John Christian, W. H. Vail, Charles Roper, Clem. Cushman, Albinus Smith, Peter Seward, William Moore, H. E. Karau and Jack Atkinson.

Crane Co., Chicago, Ill., has opened two new branch offices, one in San Diego, Cal., and one in Phoenix, Ariz. In the latter city the company has purchased the business of the H. Mulrein Plumbing Supply Company.

Central Radiator Co., New York, announces that over 1200 visitors registered at its booth at the recent exposition of heating and plumbing apparatus and supplies held in connection with the convention of the National Association of Master Plumbers, in Detroit, June 6-8. In connection with this exhibit the company ran a prize contest for one of its Radio open fireplace water radiators and eight Domic water heaters. Each visitor was presented with a key tag bearing a number. In the drawing, which took place on the last day of the convention, the winning number proved to be 863. This number was held by Mrs. W. R. Mikesell, of Wilkinsburg, Pa., who was awarded the Radio open fireplace water radiator. The eight Domic water heaters were awarded as follows: Albert P. Willis, 2186 East Grand Boulevard, Detroit; W. G. Royer & Son, 510 Stuyvesant Avenue, Trenton, N. J.; Geiser & Son, Danville, Ill.; Harry Hauck, 34 Astoria Ave., Long Island City, N. Y.; J. K. Miller, City Hall, Flint, Mich.; Cullyford Plumbing & Heating Co., 1210 California St., Denver, Colo.; Daniel J. Finnerty, Boston, Mass.; and George Luckins, 2705 Clementine St., Philadelphia, Pa. Those who were not among the prize-winners have the satisfaction of knowing that they have key insurance for life. Their names and addresses are on the Central Radiator Company's permanent register and should a bunch of keys linked with the "Radio" tag become lost, the keys may be expected to find their way to the Central Radiator Co., New York, and will in turn be passed on to the original owner.

Pierce, Butler & Pierce Mfg. Corporation, New York, has purchased the heating and plumbing supply business of the Mason & Hanson Co., in New London, Conn. Mr. Hanson will continue as local manager of the company.

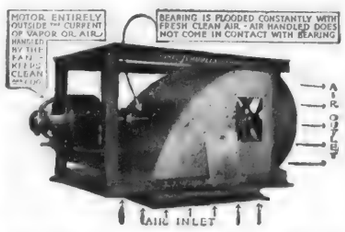
Central Station Heating Notes.

Cleveland, O.—New rates for steam heat furnished by the municipal heating plant at an increase of approximately 25% over last year's rates have been fixed by the Board of Control. The increase, according to Public Utilities Director Roberts, will make the plant almost self-supporting and will reduce an annual deficit of about $20,000

WING-SCRUPLEX EXHAUSTER

Saving 11 H.P. Out of 25

And a lot of Valuable Floor Space Besides—


MOTOR ENTIRELY OUTSIDE THE CURRENT OF VAPOR OR AIR HANDLED BY THE FAN - KEEPS CLEAN
BEARING IS FLOODED CONSTANTLY WITH FRESH CLEAN AIR - AIR HANDLED DOES NOT COME IN CONTACT WITH BEARING
AIR OUTLET
AIR INLET

Wing-Scruplex Exhauster, specially designed for removing vapors, heated air, chemical fumes, etc., in factories, industrial plants, etc.

This is what a large New England Chemical Plant did by using seven Wing-Scruplex Exhausters instead of one large Exhauster of another type, for exhausting fumes from seven vats.

WHAT THIS MEANS IN DOLLARS

even if power costs only 2c. per hour per horsepower, figuring an 8-hour day and 300-day year, the saving is

$528.00 PER YEAR

And there is still another saving—when only one vat is used, they only operate one Exhauster.

We would like to show you how Wing-Scruplex Exhausters will save money for your clients.

Write for new Bulletin

L. J. Wing Mfg. Co.

FANS and BLOWERS | UNIT HEATERS DAMPER REGULATORS | SMALL TURBINES

Hudson and 13th Sts., New York

WING-SCRUPLEX FAN

Wing-Scruplex (*screw propeller*) Fan for general ventilation of stores, factories, offices, homes, etc.

Vento Return Line Valve

for Vacuum and Vapor Heating Systems is a fuel-saver from the moment that it is put to work on the heating system. It never fails in its promise to make the heating system give dollar-for-dollar service for every ounce of fuel consumed. Our latest Booklet, "The Perfect Heating System," will be mailed on request to any heating engineer.

WM. S. HAINES & COMPANY
PHILADELPHIA

Steam Traps Steam Separators Oil Separators Strainers
Air Traps Exhaust Heads Boiler Alarm Water Columns

WRIGHT AUSTIN

WA Standard with STEAM USERS SINCE '94

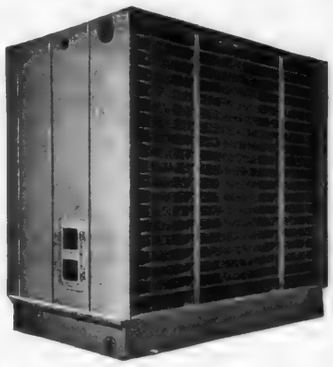
WRIGHT-AUSTIN CO. DETROIT, MICHIGAN

Peerless Ventilator

BUILT RIGHT RUN RIGHT

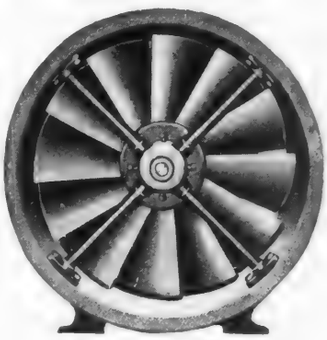
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**



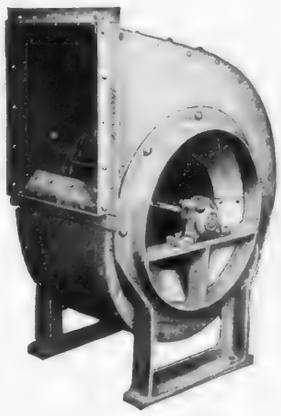
Peerless Air Washer

We manufacture a complete line of fan equipment and appurtenances. By concentrating on this one class of products we are able to make them better every year.



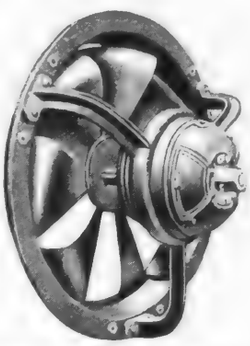
Pulley Driven Disc Fan for Mines

The old fallacy that fan equipment was a luxury is now known to be untrue; it is an economical necessity. We can give actual installations in all kinds of industries where through the wise employment of fan equipment manufacturers have improved the quality of their product, and increased production with a reduction in factory cost.

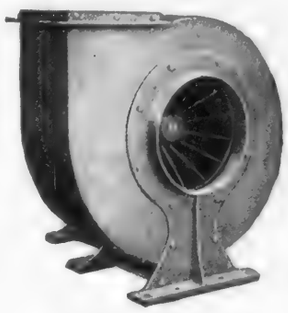


Type "C" Seri-Vane Fan

If you are interested in drying, humidifying, heating, ventilating, mechanical draft, removal of shavings or similar installations, please communicate with us. If we cannot honestly prove facts to you showing the benefits that will follow from an installation for your special problem, we will frankly so state.



Motor Driven Propeller Fan

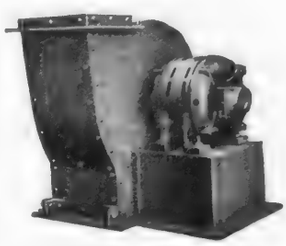


Slow Speed Planing Mill Exhauster

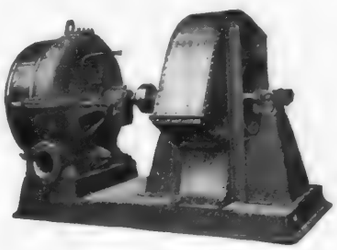
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**

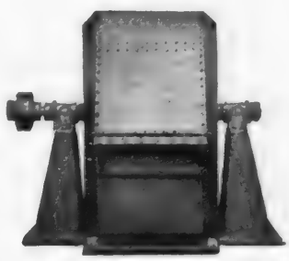
Branch Offices in Principal Cities



High Speed Type "C" Seri-Vane Fan



High Pressure Blower Direct Connected to Turbine



Stoker Fan

to not more than $5,000. Effective June 1 there is to be a flat charge of 10 cents per square foot of radiation, with a sliding scale of from 68 cents per 1000 lbs. of condensation for the first 20,000 lbs. to 55 cents per 1000 lbs. for all over 600,000 lbs. These rates are to apply when coal costs are from $3.10 to $3.50 per ton. For every 10 cent increase in the price of coal, the rates for steam go up 1 cent. For every 10-cent decrease, the steam price drops 1 cent. The former rate for steam was 75 cents per 1000 lbs.

Belvidere, Ill.—Extensions to the plant of the Belvidere Heating Company, including the installation of auxiliary boilers, are being planned, to be completed in time for the opening of next heating season.

Dover, O.—Renewal for two or three years of the steam heating franchise for the downtown section of New Philadelphia, O., has been asked of the New Philadelphia, city council by the Ohio Service Company. The proposed new franchise is similar to the one just expiring and carries a guarantee to furnish steam heat from October 1 to June 1 at 75 cents per 1000 lbs.

Rock Rapids, Ia.—The Tweed Engineering Company is investigating the feasibility of heating the proposed new school building in Rock Rapids with city heat. At the same time this company is investigating the practicability of extending the heating system to that part of the residence district near the high school. If this is done it will be necessary to increase the boiler capacity at the city plant.

Bad Axe, Mich. — Broadening the service of the Central Power Company of Bad Axe to include a central steam heating plant for the city is the subject of investigation by several business men of Bad Axe, headed by Norman Frost, manager of the power company.

New Firms.

Robinson and Brigham, 314 Main Street, Worcester, Mass., is the title of a new firm of heating engineers and contractors. The firm desires to receive circulars from the trade in general. It will specialize in high and low-pressure steam piping and all kinds of heating. The senior partner, Harry C. Robinson, has had 34 years' experience in the heating field, having been connected with the Central Supply Co., of Worcester, for 16 years. Previously he was for 18 years with Braman, Dow & Company. The other partner, Lucius S. Brigham, has been in the heating business in Worcester for the past seven years, having conducted his own shop during that time.

New Incorporations.

Able Plumbing & Heating Co., 1523 South State St., Chicago, capital $2000, to conduct a heating and plumbing contracting business; Incorporators: Thomas McCaffrey, Eugene McCaffrey, and Richard McCabe. Correspondent. McCaffrey & Keller, 155 North Clark St., Chicago.

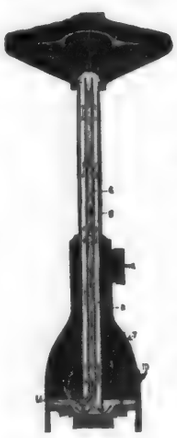
Nicheols Plumbing & Heating Co., Louisville, Ky., capital $25,000. Incorporators: Robert S. Nicheols, George A. Schmitt and J. H. Scales, all of Louisville.

Geneva Heater Co., Inc., Geneva, Ill., capital $300,000, to manufacture heating machinery at Eighth and James Streets, Geneva. Among the principal stockholders are C. H. Toombs, Geneva; Oscar Newles, Geneva; Morton B. Fish, Geneva; and T. J. Stellings, Davenport, Ia.

Boiler Sealtite Co., 239 East 63rd St., Chicago, organized to manufacture boiler and radiator compounds. President, E. C. Garrity, who is president of the Central Supply Association and also president of the National Plumbing & Heating Supply Co., Chicago; vice-president, M. M. Keeley.

T. A. Wade Co., Inc., 80 John St., New York, has been organized to deal in piping, valves and fittings. The new company is composed of T. A. Wade and Oscar J. Johnson. Both were formerly connected with R. J. Donovan & Co., New York, Mr. Wade having been for the past five years secretary and general manager of the Donovan company.

The Honeywell Heat Generator



is the heart of the Honeywell Hot Water Heating System, giving absolute control together with a range of temperature from 85 to 240°. Compare this remarkable flexibility with the 212° to 220° of a good steam system or the 150° to 212° of a good vapor system.

The universal success, the never disappointing years of operation of the HONEYWELL SYSTEM have proved conclusively that the theory upon which it is based is correct. An increased and positive circulation; an instantaneous heat under perfect control, quickly increased or checked; the use of smaller valves and piping, with less water to move; the sending of even heat into radiators at extreme distance from boiler; minimum amount of piping; an easy layout for the fitter and the minimum cost of installation and operation.

Tank-in-attic or Tank-in-basement layouts as desired.

Years of use and thousands installed in the United States, Canada and other countries have proved its superiority.

Helpful Engineering Service supplied.

Our booklet "How to Properly Design and Install the Honeywell Method of Hot Water Heating" tells the whole story and will be mailed on request.

The Honeywell Heating Specialty Co.

WABASH, INDIANA

Manufactured in Montreal for Canadian Trade

DEPENDABILITY!

SYNONYMOUS WITH STANDARD "Metallic" THERMOMETERS

DURABLE
DEPENDABLE
EASY TO READ
PRACTICALLY INDESTRUCTIBLE
SENSITIVE TO CHANGING TEMPERATURES

WARRANTED ACCURATE

Standard "Metallic" Thermometers are built for long and reliable service—backed by our experience of nearly forty years as Thermometer Manufacturers—made in INDICATING or RECORDING type, with ANGLE or STRAIGHT STEM. Write us about your requirements or send for descriptive booklet. We have a variety of sizes and models from which you can select your STANDARD "Metallic" THERMOMETERS.

STANDARD THERMOMETER CO.

Clifton St., Boston 19, Mass.

Nearly Forty Years as Thermometer Manufacturers

James M. Seymour

Established 1888

Lawrence St., Mechanic St. and Kirk Place

Newark, New Jersey, U.S.A.

PROPELLOR TYPE FANS

Patented

Many styles for many kinds of service. Low pressure Fans that deliver immense volumes of air at low velocity.

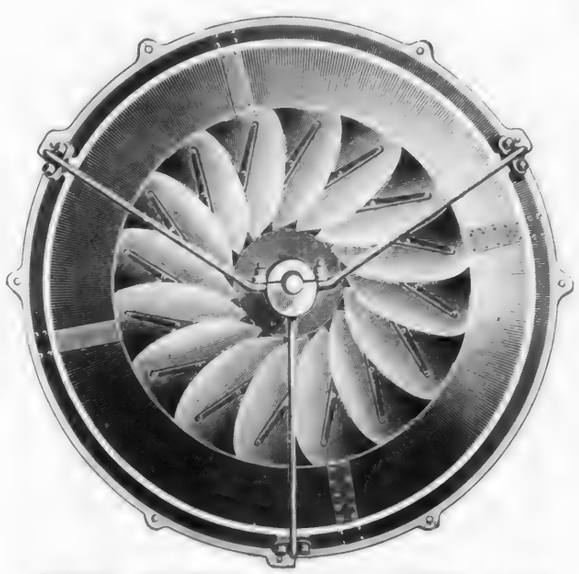
Cone cased Fans for higher pressures, Extreme Fans for high pressure and high velocity.

Compound Fans from 11 feet in diameter to 24 feet in diameter for Mine Ventilation.

Hyatt Roller Bearings. Anti-Friction Metallic wick, self-oiling bearings, and Ball Bearings if the purchaser prefers.

AUDITORIUM FANS

SEND FOR BULLETINS



CONE CASED HIGH DUTY FAN

PRICE LIST

AUDITORIUM FANS

	Single Fan	Twin Fans
24 Inch,	$ 50.00	$ 90.00
30 "	65.00	120.00
36 "	85.00	160.00
42 "	100.00	190.00
48 "	125.00	225.00
54 "	150.00	275.00
60 "	175.00	325.00
72 "	225.00	400.00
84 "	275.00	500.00
96 "	325.00	600.00
108 "	400.00	750.00
120 "	475.00	900.00

SEYMOUR FANS are not an experiment. Over 100,000 now in service. Built of the best materials. Good Workmanship. Commercially Attractive Prices.

Contracts Awarded.

Springfield, O.—Bids were received as follows for the heating and ventilating of the new Junior High School on North Limestone Street, Springfield: Columbus Heating and Ventilating Co., $23,340; Bryce Heating and Ventilating Co., $21,600; Stanton Heater Co., $23,400; American Warming & Ventilating Co., $20,000. The general contract, which amounts to $230,000, was awarded to T. A. Graham.

E. J. Ryan, Danville, Ill., was the low bidder, at $140,800, for the heating and ventilating of the new high school in Danville. Other bids were: Sodemann Co., St. Louis, Mo., $146,487; W. W. Johnson, $148,507; V. W. Hoier, Chicago, $152,000; A. J. Anderson, Louisville, Ky., $178,000; and the Victor Pipe Co., Chicago, $179,012. E. J. Ryan was also the lowest bidder for the plumbing work, amounting to $76,659. The total construction cost came to slightly more than $1,000,000, which shows a saving of $250,000 over the estimated cost two years ago.

Lebanon, Ind.—All bids for the construction of the first unit of the new high school building in Lebanon were rejected as being too high. Those submitted for the heating and ventilating work are as follows: W. H. Johnson & Son Co., Indianapolis, $19,598; Sam Wade, Mooresville, $22,700; Freyn Bros., Indianapolis, $19,970; Hayes Bros., Indianapolis, $19,796; Roland M. Cotton Co., Indianapolis, $20,000; Strong Bros., Indianapolis, $21,262.

William H. Conklin Co., Columbus, O., heating and ventilating and plumbing for the new Abraham Lincoln High School, on Thurman Avenue, for $110,225. Mr. Conklin, president of the firm, resigned from the Board of Education in April so that his company might bid on the heating and plumbing work in the new schools. Huffman-Wolfe Company was awarded the contract for the temperature control in this building at its bid of $8,157. The Conklin company also had the low bid for the heating and plumbing of the new Central High School, but it was thrown out, due to a technical error.

Salina, Kan.—Bids were received as follows for the heating, ventilating and plumbing of the new Memorial Hall in Salina. David Hill, Salina, $29,273; City Plumbing Company, Salina, $25,911 (included); Bachofer Plumbing Company, Salina, $32,826; Salina Plumbing Company, $31,500; J. H. Wright, Joplin, $31,423; Robert Parks Heating and Plumbing Co., $30,357 (included); Ryan Plumbing Company, Davenport, $23,021.29 (heating and ventilation only).

Ryan Plumbing & Heating Co., Davenport, Ia., heating and ventilating the library addition for $13,639. The total cost of the addition will be $118,000.

Hutzel & Co., Muncie, Ind., heating and ventilating Central School, Muncie, for $16,550.

Quest & Smith, Waterloo, Ia., heating and plumbing Allen Memorial Hospital in Waterloo, for $39,935. Other bids were: F. J. Spriggs, St. Paul, Minn. (heating $17,950; plumbing, $27,600); Carstens Bros., Ackley, (heating, $17,784; plumbing, $26,759); Zook & Bentz, Waterloo (heating) $41,800; Huston & Hughes, Minneapolis, (heating, $19,350; plumbing, $26,835); O. F. Kohl & Co., Minneapolis (heating, $17,586; plumbing, $24,885); Archambo Heating Co., Minneapolis (heating, $18,862; plumbing, $24,726); Bruner & Salz (heating only $19,000); Western Heating Co., Minneapolis, (heating, $20,760; plumbing, $26,985); Frank Eha, St. Paul, (heating only) $22,202.

Hipskind Plumbing Co., Wabash, Ind., heating, ventilating and plumbing new Monticello school building for $13,500.

Goshen Plumbing & Heating Co., Goshen, Ind., heating and plumbing new high school building in Goshen for $55,199. The firm is composed of Roy B. Noble and Armin Toelle, of Princeton, Ind.

Stockton, Cal.—Bids were received as follows for the heating and ventilation of the Victory School building in Stockton Acres: Latourrette-Fical Co., Sacramento, $19,900 (low bid); Miller-Hays Co., $20,500; E. L. Gnekow, $21,390; Stockton Plumbing & Supply Co., $21,588; Pahl & Harry, $23,691; F. P. Sexton & Co., $23,950; Scott & Co., San Francisco, $25,380.

THE DOUGLASS HUMIDIFIER

STANDARD TYPE
Made in three sizes for direct connection to steam piping

Is attached directly to the steam heating system

Discharges dry steam noiselessly

Gives satisfactory results in any type of building equipped with steam

Inexpensive to install

Will not get out of order

No attention required

No maintenance expense

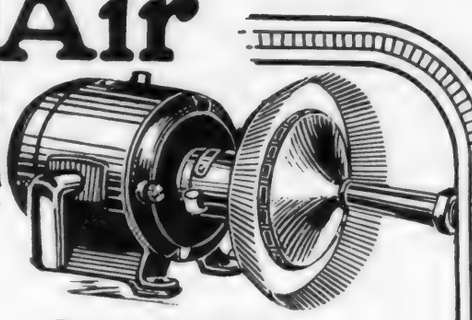
Made in various sizes and types to suit all conditions and requirements

Illustrated catalogue sent on request

THOMAS J. DOUGLASS & CO.
352 Whiting Street
Chicago, Ill.

RADIATOR TYPE
Is attached to steam radiator in place of the air valve. Made in one size only.

A Breath of Rain-Washed Air



THE TURBO ATOMIZER

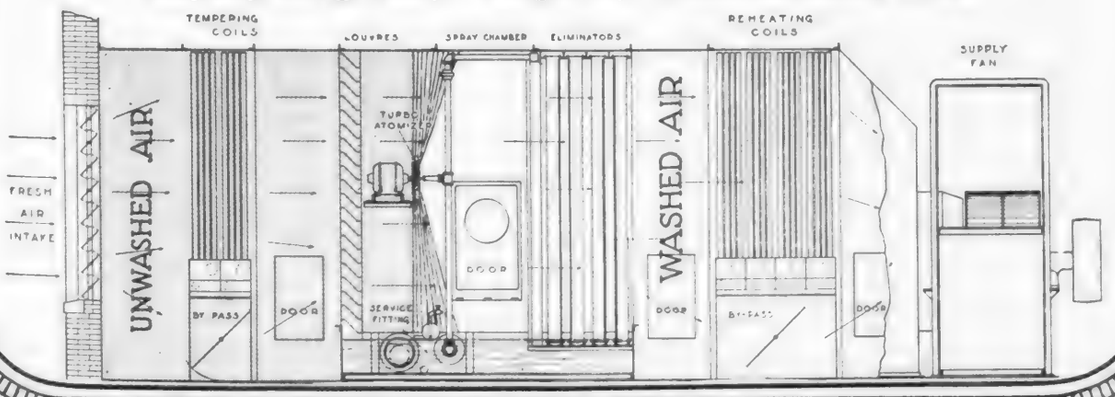
YOU have often noticed how pure and invigorating the air is after a summer shower.—Haven't you?—Cooled to a comfortable temperature and with oxygen and humidity balanced to a point where it tickles your lungs in much the same manner your favorite dish tickles your palate. Pure, properly conditioned air is food for your system as important as properly prepared victuals. You can live for quite a while without food, or even without water, but only a few minutes without air would end your usefulness, yet you and millions of other people spend hours, even whole days in stores, theatres, office and public buildings, factories and schools where the air is poisoned with impurities that enter the system through the lungs.

The Bayley Turbo Air Washer

assures a steady flow of pure air,—air that has been washed by passing through a fine water spray, just as nature washes it during a shower. A complete washer and conditioner (as shown below) draws the impure air, as shown by the dark section, through a dense curtain of fine mist tempered to reduce or increase the humidity of the air as required, then through tempering coils that regulate the temperature to any desired degree regardless of outside weather conditions. The atomizer (shown above) operates at low pressure, will not clog and can be installed in any air washing system.

Send for free book on air washers today.

Bayley Mfg. Co., Dept. E, Milwaukee, Wis.



Hartford, Conn.—Bids for the heating and ventilation of the new State Normal School in Hartford were received as follows: Libby & Blinn, Hartford, $68,148; C. W. Cunningham Co., Hartford, $72,568; M. A. Dame & Sons Co., Boston, $63,500; Jenning & Peoples, Inc., Newark, N. J., $70,813; Ingalls & Kendricken, Inc., Boston, $66,066; Lord Construction Co., Boston, $67,667; Wycoff & Lloyd Co., Springfield, Mass., $68,057; Rhode Island Supply & Sprinkler Co., $71,459; John R. Proctor, New York City, $69,987; Robbins, Gamwell & Co., Pittsfield, Mass., $70,300; McMurrer Co., Boston, $65,222; Huey Bros., Boston, $63,977; Grinnell Co., Inc., Providence, R. I., $65,000; Power Heating & Ventilating Co., Boston, $65,500; Lynch & Woodward, Boston, $64,826; M. J. Daley & Sons, Waterbury, $59,977; Austin Engineering Co., New York City, $65,875; W. G. Cornell Co., Boston, $67,776.

Some Forms of Solid-Top Gas Stoves a Menace to Health.

Some solid-top gas stoves without a flue connection are a menace to health and do not even possess the advantage of increased economy in gas consumption. The Bureau of Standards of the Department of Commerce has been investigating the principles involved in the designing of gas stoves and burners and has found that some devices which are being sold to the public as "gas savers" are in reality very dangerous articles.

One scheme which it is understood is in quite general use is to place over an ordinary gas stove designed with a grid top and without a flue, a solid metal top covering the whole area of the stove. The use of such an arrangement is said to give a larger heating surface, so that articles can be heated although not directly over the burner. Practical tests have shown that the heat is insufficient to do any cooking at all except directly over the burner and even over the burner, it takes twice as long to boil a kettle of water as over an ordinary open top.

The bureau's work shows that the main result of using any device of this kind is to cut down the heating efficiency and to produce large quantities of carbon monoxide, an extremely poisonous gas.

Trade Literature.

NITROSE, described as a glossy, black, elastic, rust-defying coating for metal exposed to the weather, high temperatures, moisture, brine, ammonia, sulphur or acid fumes, has been brought out by the Nitrose Company, Peoria, Ill. One of the principals of the company is H. R. Wetherell, formerly superintendent of heating for the Central Illinois Light Company, and later in charge of the heating plants operated by Hopendyl, Hardy & Co. He is a former president of the National District Heating Association.

Nitrose, it is stated, is made from a chemically-treated coal-tar base and will not separate on standing. It can be applied directly over rust, as it appears to penetrate the rust and adhere to the sound metal. Wet, oily or greasy surfaces, it is added, can be painted over without affecting the result or the drying qualities of Nitrose. It is described as especially adapted to breechings, boiler fronts and steam piping. It may also be applied to wooden surfaces.

The company has established a New York office at 1540 Broadway, in charge of R. E. Hagenah.

Barnes & Jones, Boston, Mass., have purchased the building at 5 Melrose St., Boston 11, Mass., and are having it remodeled to suit their requirements in connection with the sale of the Barnes & Jones line of modulation, vapor and vacuum heating apparatus.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

Experienced Heating Man desires to connect with established contractor as heating estimator. Address Box 18, care of Heating and Ventilating Magazine.

MASSACHUSETTS
DAVIDSON PROPELLER
FANS

Are especially suitable for handling large volumes of air at low resistances.

Massachusetts Blower Co.
Watertown, Mass.
Sales Offices in Principal Cities

The Justly Famous "Mushroom" Notch

Assures fresh air for theatres and auditoriums by distributing the air uniformly. It is easily adjusted to different openings and locked.

Made of cast iron for either wood or concrete floors.

KNOWLES "FRESH AIR" PRODUCTS

The "Camelback" Air Diffuser

A new device by which a large volume of air is introduced and distributed throughout the auditorium at a minimum of cost and friction loss.

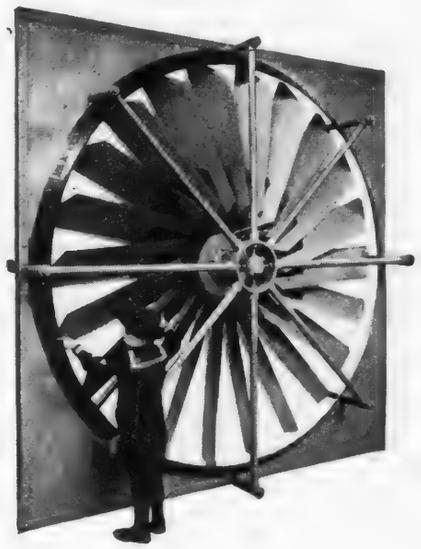
The Knowles Air Hood

An air deflector used in auditoriums, under the aisle seats, to throw air out into the aisle in one direction. An inexpensive method of introducing a large volume of air without draughts.

Send for blueprints and prices

Knowles Mushroom Ventilator Co.
202-204 Franklin St. New York City

In a class by itself—



Typhoons are used wherever the most is demanded for low pressure work.

The Typhoon cone ring, self-aligning ball bearings and other Typhoon features insure the superior air volume and low power consumption for which Typhoons are noted.

No attention is required except for occasional greasing of the self-aligning ball bearings.

The Typhoon square frame makes installation easy—and economical.

Made with belt drive in sizes from 2 ft. to 12 ft.; and direct-connected to G. E. motors in sizes from 2 ft. to 4 ft.

WRITE FOR CATALOG V-1

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PHILADELPHIA, PA.
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TYPHOON FAN COMPANY

ERNST GLANTZBERG, President

345 WEST 39th STREET, NEW YORK, N. Y.

LOS ANGELES, CAL.
NEW ORLEANS, LA.
RALEIGH, N. C.

HOTEL COMMODORE

SPRAGUE ELECTRIC MOTORS

are used to drive the

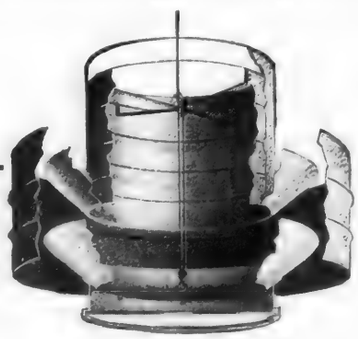
VENTILATING SYSTEM

in the

HOTEL COMMODORE

Complete service rendered to Architects and Engineers for all kinds of electrical equipments for buildings.

SPRAGUE ELECTRIC WORKS
Of General Electric Company
PIONEERS OF THE INDUSTRY
Main Offices 527 W. 34th St. New York
Branch Offices in Principal Cities



The Solution of Your Ventilating Problems is

THE BURT GLASS TOP VENTILATOR

a combination ventilator and skylight in which the light is never obstructed or shut off, no matter how much or how little ventilation is required. A stationary ventilator with the sliding sleeve damper—an exclusive feature. Enormous pulling power. Storm proof and manufactured in any size required.

Send for 128 page catalog showing installations.

THE BURT MANUFACTURING CO.
261 Main Street Akron, Ohio

Cycloidal MULTIVANE FANS
TRADE MARK

Heating and
Ventilating
Apparatus
Fans and
Blowers

Garden City Fan Co.
Manufacturers since 1879
McCormick Bldg.
CHICAGO

Eastern Office
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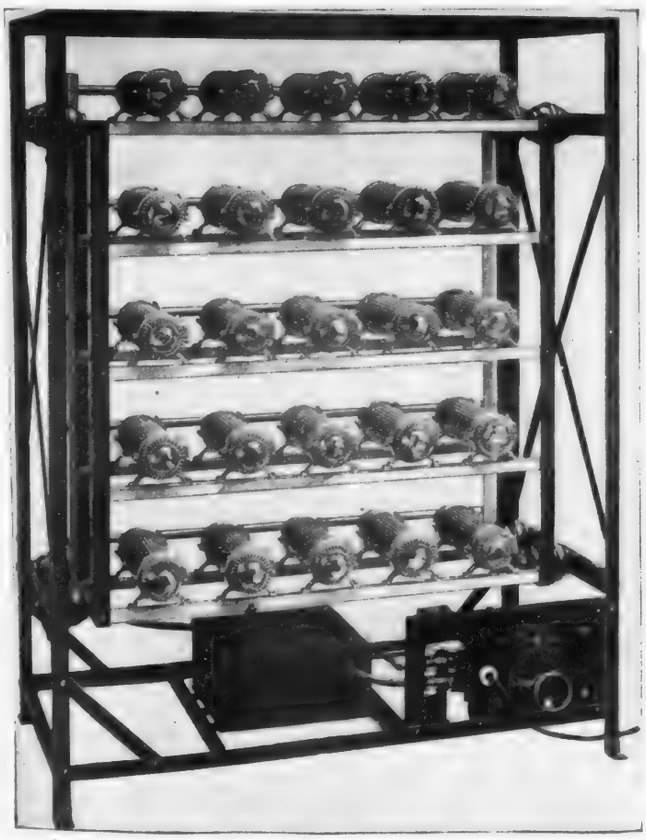
47 W. 34th Street
New York

IDEAL AIR CONDITIONS FOR THE NATION'S CAPITOL



A 25-unit Ozone Pure Arifier that on the basis of 10c per kw. hr. will run 10 hrs. at the cost of 12c ozoning 25000 cu. ft. of air per minute.

Two Ozone Pure Arifier equipments, 100 cylinder units of the type shown here, are successfully operating in our Capitol in connection with the mechanical ventilating system.

These units ozonize 40,000 cu. ft. of air per minute for the Senate and 60,000 cu. ft. of air per minute for the House of Representatives, giving our legislators a pure, fresh and invigorating atmosphere in which to conduct the affairs of the nation.

Ozonization is the latest scientific method of insuring fresh air and the Ozone Pure Arifier is the latest scientific device. These arifiers are made in any size desired to meet exact requirements, and from the Nation's Capitol to the Home, the Ozone Pure Arifier is daily affording healthful ventilation, efficiently, scientifically and economically.

Our latest bulletin entitled "Nature at Her Best" will give you some very interesting facts about Ozone that you as an Architect, Engineer or Contractor should be familiar with. Send for it.

OZONE PURE ARIFIER COMPANY
Chicago, Illinois

FIRST THE FACTS —*then the evidence*

GIVE your clients these facts on Twin-Fire performance;-(1) Doubled furnace temperature *with less fuel* over the ordinary setting; (2) Prevention of smoke; (3) Increase in boiler power; (4) Elimination of dirty tubes; (5) Combustion of any grade of coal; and (6) Saving of 10-30% of fuel. All these superiorities are *warranted* in the flexible

Twin-Fire
HAND STOKER
"It Burns the Smoke"

As evidence, read this list of buildings, *in Chicago alone*, all living monuments to Twin-Fire s emciency and remember that these are but a few:-

State-Lake Bldg.
Garland Bldg.
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North Pier Terminal Bldg.
South Shore Country Club
Central Scientific Bldg.
Schulze Bakery Bldg.
J. P. Smith Shoe Co.
Cadillac Motor Co. Bldg.

Now on the Press
Reserve Your Copy

"More Boiler Power with Less Fuel" tells the story. Handy in size for data files. Every architect and heating engineer should have it. A post-card will reserve a copy for you Write now—*Today!*

TWIN-FIRE FURNACE COMPANY
1253 1st National Bank Bldg., Chicago, Ill.
"Successful Furnace Builders Since 1898"

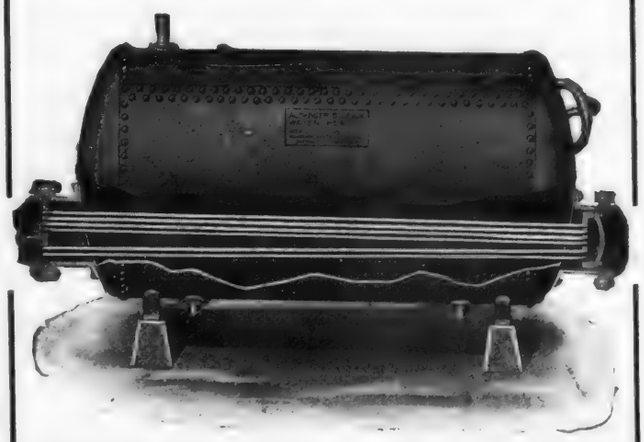
Save Steam

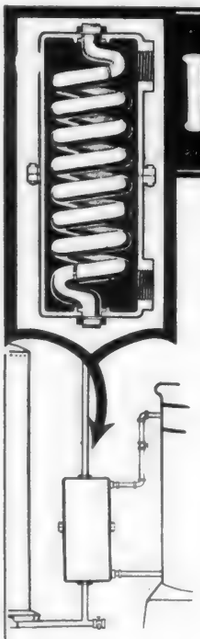
for your clients by specifying

ALBERGER (Buffalo) HEATERS

The hot water supply can be heated to the desired temperature with less steam with ALBERGER HEATERS, because both the water and the steam can circulate better, due to the extension of the heating element through the shell and the continuous drainage of the heater tubes. Designed for specified conditions. Write us for catalog now.

Alberger Heater Company, Buffalo, N. Y.





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HOT WATER
NO EXTRA EXPENSE

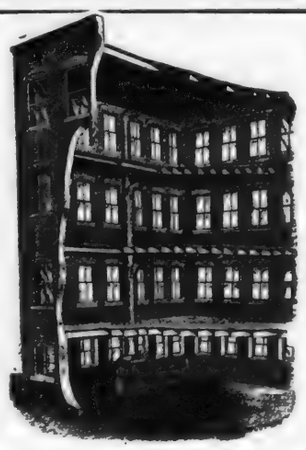
The most approved and economical method of heating water for domestic purposes. An abundant supply of hot water at just the right temperature, 24 hours a day, at practically no extra cost. Easily connected to outside of steam, vapor or hot water boiler; does away with fuel-wasting coil in fire pot, uses surplus heat of boiler. Does not overheat or underheat. Will not burn out, once installed.

An unusual opportunity for live dealers. Order now and be prepared for the demand being created. We furnish cooperation and practical sale helps to give you full benefit of our national advertising. Write for full details.

The Hotstream Heater Co.
"Makers of Heaters that Heat"
Cleveland, Ohio

The
Hotstream
INDIRECT WATER HEATER

We also make a complete line of Gas and Kerosene Water Heaters.



PORBECK INDUSTRIAL AIR HEATER

Adapted for heating and ventilating large buildings. No need of distributing pipes. Takes full advantage of the laws of nature in the production of warmed air and utilizes these laws in providing an even distribution of warmth and comfort throughout the largest of buildings.

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PORBECK MFG. CO.
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Ross

Surface Barometric and Jet Condensing Equipments for Power Plants.
Main, Auxiliary, Distilling Condensers & Evaporators for Marine Service.
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Crosshead Guided" Expansion Joints
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THE BRAND THAT LEADING ENGINEERS DEMAND

Westinghouse

THE selection of Westinghouse Motors for the Ventilating fans in the new Bankers Trust Company Building of New York is in keeping with the high standard of equipment used throughout the structure.

The motors, built from duplicates of long tried standard designs, are highly simplified in design and construction.

Their operation is quiet, constant and reliable. They require little care or attention and they are built of materials that give years of service at their rated capacity.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

East Pittsburgh, Pa.

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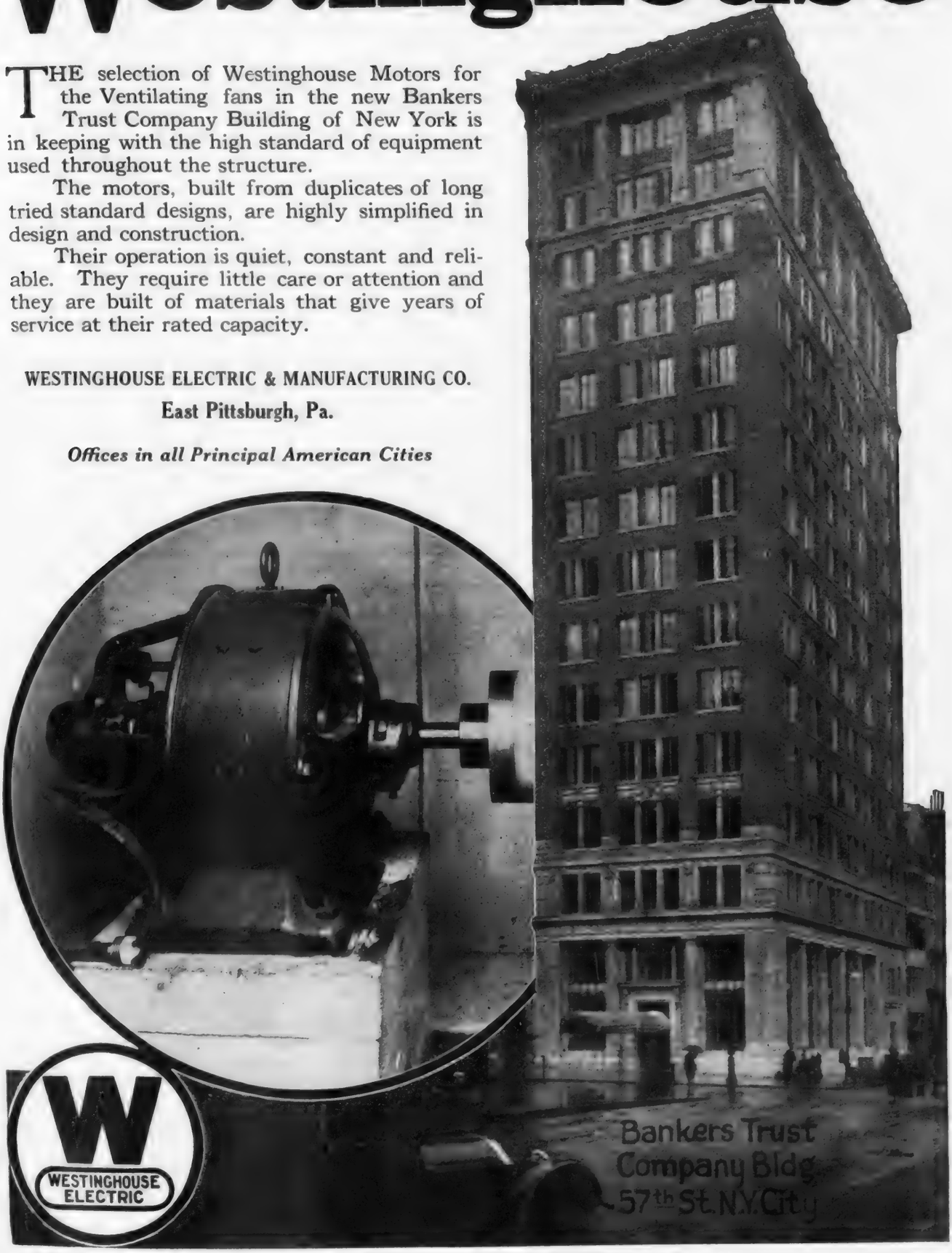
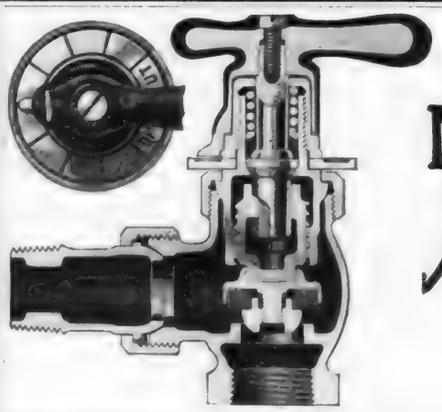
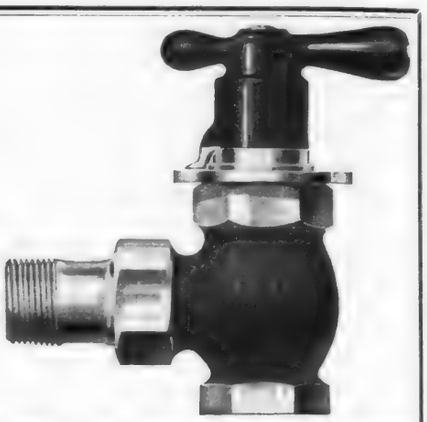




MARSH
RE-ENFORCED
MODULATED
VALVES



SOMETHING ENTIRELY NEW!

Nothing like it in Modulation valve handle construction, giving the same seating force in closing valve and smoothness of operation as with a wood wheel, completely doing away with side strain and necessity of having to reach over or around valve to operate same.

Catalogues, Lists and Discounts on Application

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TRADE MARK STERLCO

The Sterling Slide Valve Return Trap

Patent applied for

Will thoroughly drain return lines of heating systems, eliminate air without loss of vapor and return water to the boiler against pressure.

It will lift liquids to a higher level where steam or air pressure is available.

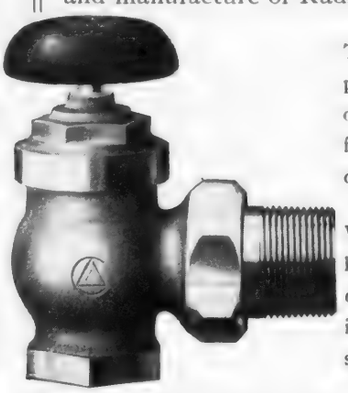
It can be placed as low as 3 inches above the water line of the boiler, thus making it possible to install vapor systems in basements with low ceilings.

A cure for sick Vapor Heating Jobs

STERLING ENGINEERING CO.
419 Third Street MILWAUKEE WISCONSIN

First In Appearance Quality and Service

The new "Genuine Detroit" Packless Radiator Valves, Bellows Type, are the result of years of experience in the design and manufacture of Radiator valves.

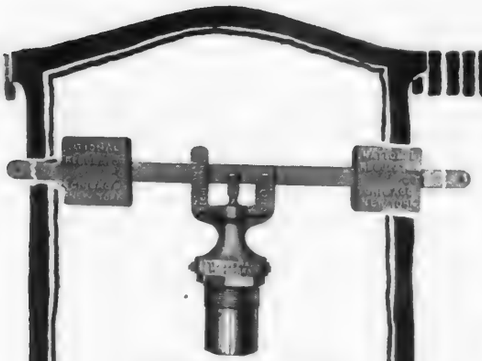


They are a high grade product of handsome design and are built for long life and freedom from trouble.

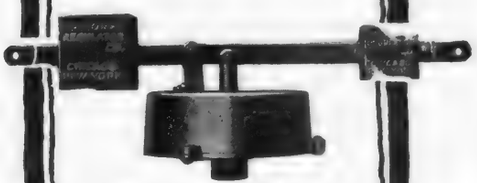
Where other valves leak and result in damage to surroundings—they do not do so.

Manufactured in all necessary styles and sizes for steam, hot water, vapor and vacuum heating systems. Let us send you booklet giving full information.

DETROIT LUBRICATOR COMPANY.
DETROIT, U.S.A.



2" Metaphram Damper Regulator for Hot Water



The New Type B-5½" for low pressure.

Metaphram Damper Regulators

FOR long service, sturdy, compact construction and for sensitiveness Metaphram Damper Regulators are unequalled. All metal construction—powerful—dependable—*guaranteed*. The most sensitive damper regulators on the market. Will fit any style of low pressure boiler and will work on ounces from 0 to 15 pounds pressure, and on hot water within 5 degrees temperature change limits. Metaphram prices are extremely low for such high quality, workmanship, design and finish. Adapted to hot water, low pressure steam and vapor. For high pressure our "A-Jacks" is best. Write us today for complete descriptive literature.

The New Type B 5½" has a most important feature in the new offset Fulcrum shown here. This fulcrum makes it possible to adjust the lift and power of the lever through a simple adjustment of the staggered fulcrum.

NATIONAL REGULATOR COMPANY

Factory and General Offices
208-212 South Jefferson Street, Chicago, Illinois

Where character is concerned—

SERVICE

The Dahlquist Mfg. Co. are specialists in copper boilers. No order is too large or too small, for all receive that degree of care and workmanship that has put Dahlquist products in the front ranks. We also manufacture copper floats, coils, bends and expansion joints.

Even such an inert thing as boilers can have character. "Character," says Webster, "is a distinctive quality by which anything is distinguished from another." Which leads to the thought of **Dahlquist Copper Boilers.**

Copper being recognized as the best metal for wear and service, it follows that the "Dahlquist Specialists" in copper boilers turn out products of character and quality.

Let us figure on your requirements

Dahlquist Manufacturing Company
40 West 3rd St. Boston, Mass.

Painted by F. R. Harper Courtesy Chicago Trust Co.

The Field Museum Equipped With Dunham Vacuum System

271,000 Square Feet Direct Radiation, 60,000 Square Feet Vento. Architects: Graham, Anderson, Probst & White. Heating Contractors: Phillips, Getschow Co

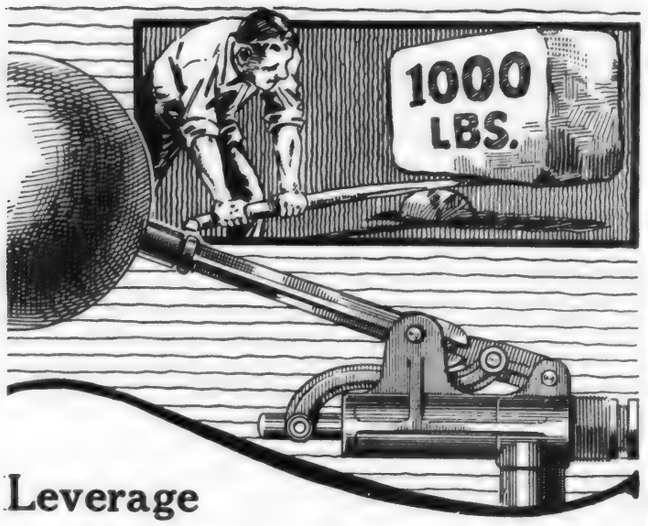
Among the many notable buildings equipped with the Dunham Heating Service is the Field Museum in Chicago.

Bulletins describing the most suitable Dunham System for any type of building will be sent on request.

C. A. DUNHAM CO.,
830 East Ohio Street, Chicago, Ill.

52 Branches and Local Sales Offices in the United States and Canada. Foreign Sales Offices in London and Paris.

The DUNHAM HEATING SERVICE
REG. TRADE MARK



Leverage Makes the Impossible Possible

Everyone knows that weights far beyond the lifting power of a man can be raised with ease by the proper application of *leverage*.

By using this leverage principle in the American Ideal Steam Trap and employing a float valve with a 60 to 1 leverage, a valve with an orifice *several times larger* than in ordinary traps can be operated against the high internal pressure. Thus, what others have found impossible has been accomplished with the

AMERICAN IDEAL STEAM TRAP

In selecting a trap, the capacity should be determined not by the size of the outlet pipe, but *by the size of the valve opening*. Because of its *extra large valve opening*, the American Ideal handles a greater volume of condensate than ordinary traps of equal size. This means that you can use a smaller, and therefore a *less expensive*, American Ideal Trap.

Back of the powerful valve mechanism is an *extra heavy*, seamless copper float of exceptionally large diameter, which is *guaranteed* for the life of the trap.

This extra large valve orifice makes it possible for dirt and scale to pass through. So there is no danger of the valve clogging, and the valve cannot chatter. The seat can be renewed without making disconnections.

Other points of superiority which make the American Ideal a most economical and efficient trap are described in our easy-to-understand manual—"A Steam Trap Catechism." May we send you a copy?

American Steam Gauge & Valve Mfg. Co.

BOSTON, MASS.

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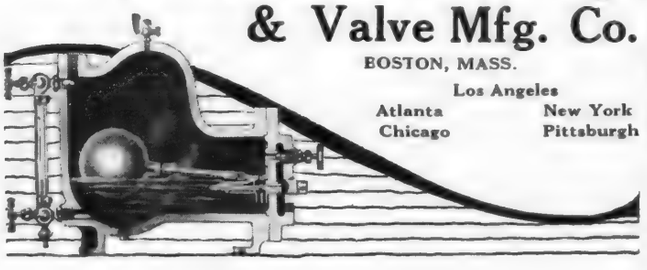


By Repute "Always" Reliable

Mason Reducing Valves have an extraordinary reputation for three things—long life, continuous service and reliability, which is, after all, only a natural tribute earned through merit.

MASON REDUCING VALVES

are made in many types and sizes, and every type and every size can be depended upon to reduce and maintain pressure at the proper delivery point, regardless of the fluctuation in the initial pressure.

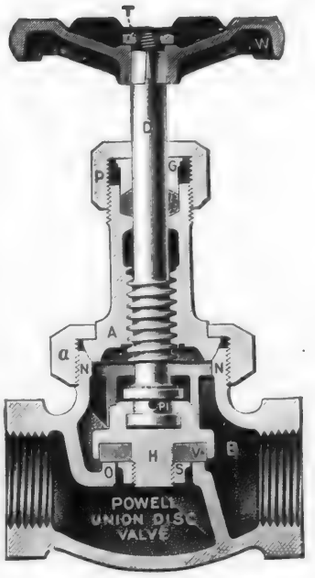
To make your assurance doubly sure, Mason service is never separated from Mason products.

If pressure regulation problems trouble you, make use of our service.

MASON REGULATOR COMPANY

Boston, Mass. San Francisco, Cal. Montreal, Canada

POWELL VALVES



UNION COMPOSITE DISC VALVES

ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

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Sole Distributors for this Section of WM. POWELL CO.'S HIGH GRADE VALVES and DEPENDABLE ENGINEERING SPECIALTIES

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CAPITOL PACKLESS QUICK OPENING VALVES

Have opposing seats.

Can be used on either pressure or vacuum systems.

Perfect in every detail.

CAPITOL PRODUCTS ALWAYS SATISFY.

Write for catalog and prices.

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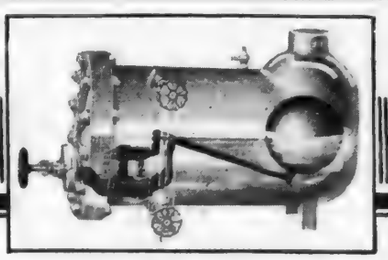
Detroit, Mich.



Better Steam Trap Service

—Assured by Davis Principles

Wherever water of condensation is to be removed from steam lines—there you need the Davis Improved Steam Trap. The Davis Trap is suitable for all heating work. It economically removes all condensed water from steam without loss and with great saving through dependable operation and negligible upkeep.

Valves are isolated from inlet, so are not injured by incoming foreign matter; sleeveless valve construction prevents clogging with sediment, scale, grease, etc.; valve seats are of Tobin bronze and are renewable. Valve casing is of non-corrosive steam metal.

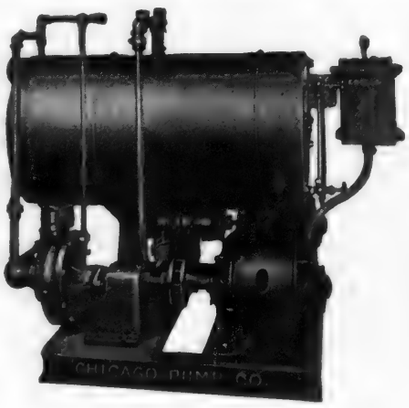
Parts are readily accessible without breaking steam line by removing cover to which all working parts are attached.

Write to the G. M. Davis Regulator Co., 136 Milwaukee Ave., Chicago, for descriptions of this and the many other Davis steam-savers.

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

Return Line Vacuum Pump

Each Pump Separately Controlled



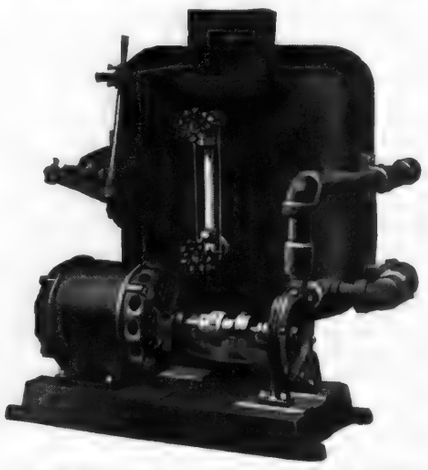
Each Run Only as Needed

A return line vacuum pump that handles air and water individually, eliminates the waste of continually running two pumps when only one is needed. This is truly efficiency and economy.

CHICAGO PUMP CO.

2325 Wolfram St., Chicago

WESTERN AUTOMATIC ELECTRIC CONDENSATION PUMP and RECEIVERS



RELIABLE **SIMPLE**

A single stage pump suitable for high or low pressure ranging from 10 lbs. to 100 lbs.

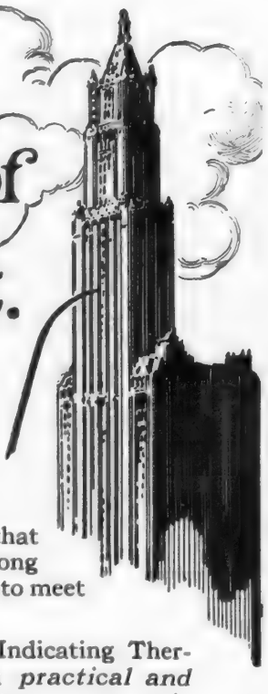
The unit is very compact, mounted on cast iron base, only two pipe connections necessary when installing. The receiver is made in two sizes, of heavy cast iron. An enclosed butt contact switch is used on all pumps.

Write for Bulletin No. 220

WESTERN ENGINEERING CO.

DAVENPORT, IOWA

Taking Temperature at a Distance of 500 ft.



Have you ever wanted to install a thermometer dial a long distance from the point where the actual temperature is taken and found that you could not get a thermometer that would operate accurately at a long enough distance from the bulb to meet your requirements?

It is now possible, with the Indicating Thermometer Sarco, to maintain a *practical and accurate* surveillance over temperatures in various heat-treat processes—at distances up to 500 feet!

Neither the transmission tube filling, nor the thermometer itself, are the least affected by temperatures higher or lower than that of the bulb. The dial always indicates the *true bulb temperature*, regardless of its own temperature or the temperature of the rooms through which the connecting tubing passes.

Manufactured by thermometer experts in our own laboratories, under the well known Fournier patents. Hundreds of thousands of Thermometers of this type have been in successful use for more than ten years.

We'll ship you a Sarco with the distinct understanding that it *must give entire satisfaction*, otherwise you may return it within 30 days and the trial will cost you nothing.

Write for Booklet P-151 and details of our Free Trial Offer.

SARCO CO., Inc.

231 Broadway, New York City

Buffalo
Chicago
Cleveland
Detroit
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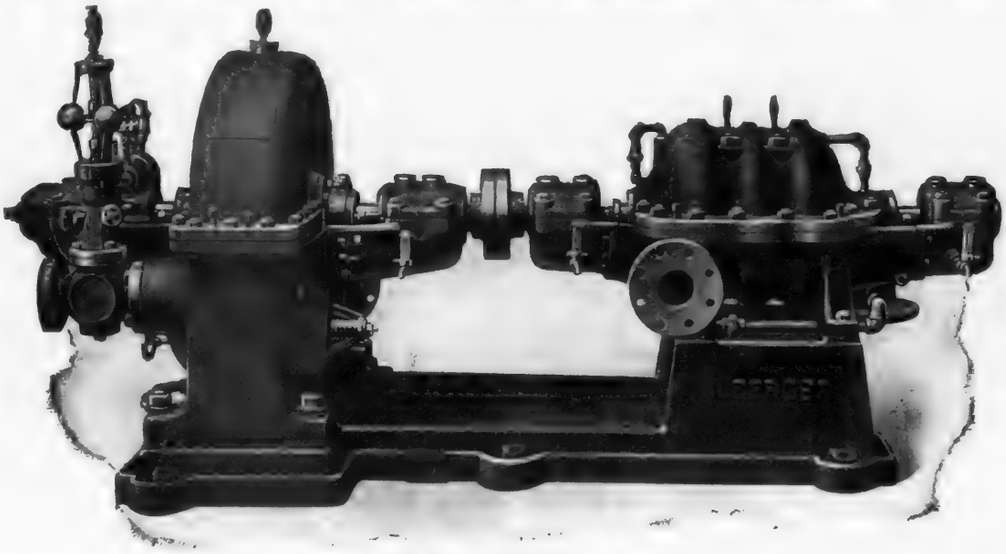
INDICATING THERMOMETER

SARCO

Alberger Centrifugal Pumps

and Alberger-Curtis Non-Condensing Steam Turbines



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ALBERGER PUMP & CONDENSER COMPANY

140 Cedar Street, New York

Boston Chicago St. Louis Philadelphia

Full Complement of Building Pumping Units

Automatic, Centrifugal, Vacuum and Boiler Feed Pumps

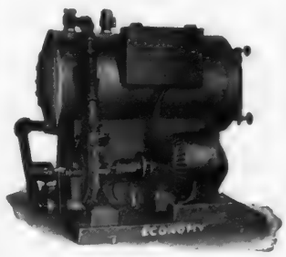
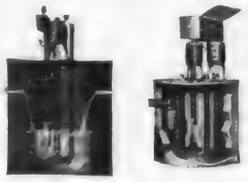


Fig. 2234

Capacities, 2500 to 65000 square feet direct radiation per standard single units.

Self Contained
High Class—Dependable

Cellar Drainers, Bilge and Sump Pumps, Sewage Ejectors



Duplex Single

Capacities, 7 to 3000 gallons per minute.

Duplex Units, Double Capacity

Made in several types and specially designed to meet all conditions.

Automatic Condensation Pumps and Receivers

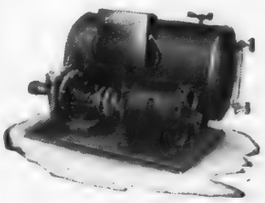
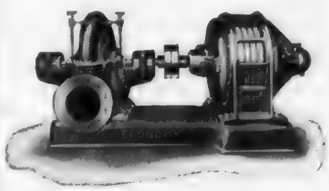


Fig. 2176

Capacities, 1000 to 125000 square feet

Made in following types: Horizontal, Vertical, and Underground. Also Piston types for extreme pressures.

Centrifugal Pumps for all purposes



Made either Single or Multi-stage

Boiler Feed house device. Hot water heating and Ice water circulating pumps.

All capacities and pressure from 5 to 5000 gallons per unit.

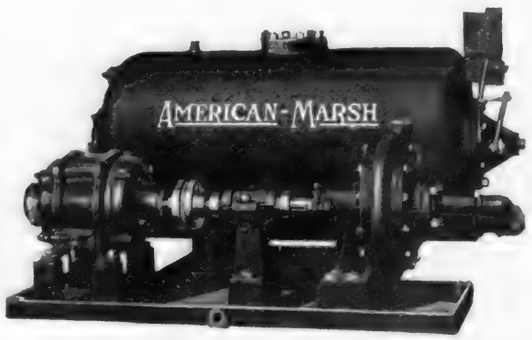
PERFORMANCE GUARANTEES

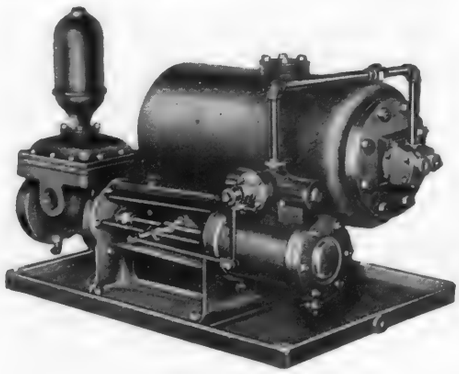
ECONOMY PUMPING MACHINERY CO.

122-124 N. Curtis St. Chicago, Illinois.

American-Marsh Condensation Pumps

Direct Acting and Centrifugal





American-Marsh Condensation Pumps are the result of over thirty-five years experience in the manufacture of high grade pumps for heating systems. They are built in the motor driven centrifugal type in both horizontal and vertical patterns, the vertical type being intended for use where the returns are laid on or under the basement floor.

The steam driven pattern is equipped with the well known American-Marsh steam valve, the same as used on American-Marsh Vacuum Pumps. With this type of valve the pump positively cannot short-stroke or race. Steam pumps can be furnished to operate on steam pressures as low as 10 pounds. On pressures lower than this the motor driven type is recommended.

May we send you our interesting booklet covering pumps for heating systems?

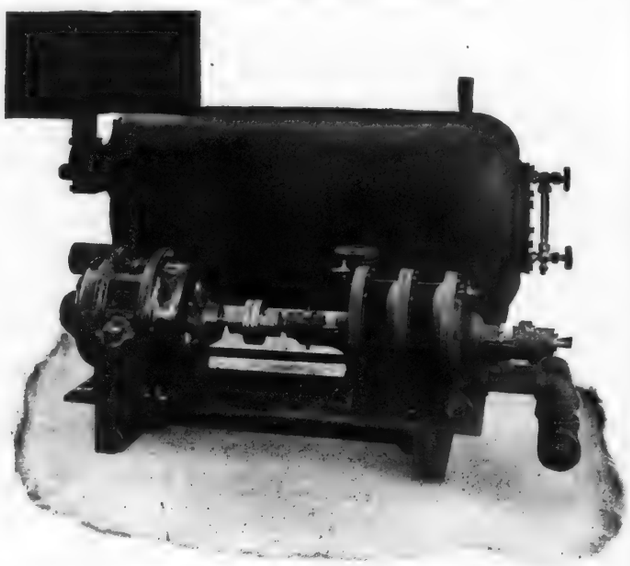
AMERICAN STEAM PUMP COMPANY, Battle Creek, Mich.

YEOMANS

ELECTRICALLY OPERATED

CONDENSATION RETURN PUMPS

HORIZONTAL AND VERTICAL



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RUGGED **RELIABLE**

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Superiority proven by years of experience.

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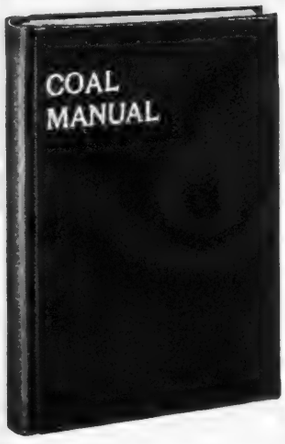


A MINE OF

INFORMATION

COAL MANUAL

by F. R. Wadleigh

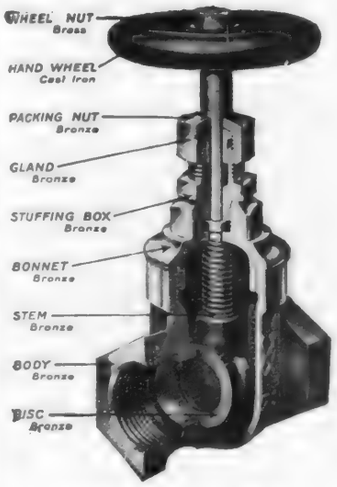
184 pages of coal sense for coal users A non-technical book on the production and uses of coal covering such subjects as; kinds and commercial grades of coal, location of various mines, the preparation of coal, coke and gas manufacture; use of coal in locomotives, boilers and furnaces; storage and prevention of spontaneous combustion; specifications and their use and analyses and effects of coal impurities. Size 4½ x 6 inches.

Price $2.50

The Heating & Ventilating Magazine

1123 Broadway New York

What is Your Valve Standard?



Most any valve will work well when new, but it takes a high grade product to stand up for a long period of years and to continue to give one hundred per cent efficient service. That's why engineers and contractors should safeguard the future interests of clients and customers by specifying the KENNEDY. In this way their specification carries with it the protection which the KENNEDY name and KENNEDY guarantee insure to valve users.

KENNEDY

For 42 years valve satisfaction has been the one object of the KENNEDY organization, and the improvements and developments which mark all valves bearing their trademark are sufficient proof of the success of their efforts. Special features embodied in the design for the distinct purpose of giving long life include:

Pipe threads of generous length which prevent leakage.
Accurate guides for seat which prevent contact of disc with seat until the valve is ready to close.
Stem of special bronze with high tensile and torsional strength.
Gland in stuffing box which eliminates leaks and avoids frequent repacking.

Other special features of Kennedy Valves are given in our latest catalog. Send for copy and keep it handy. 294

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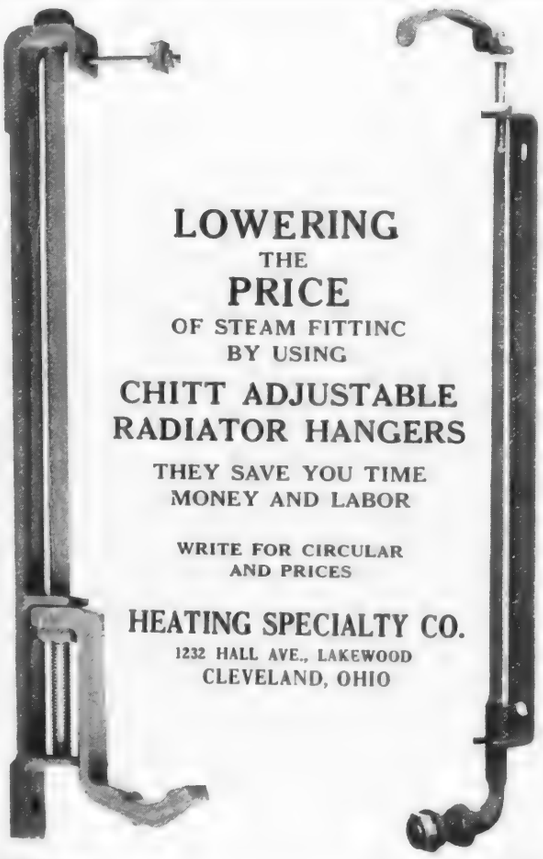

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BY USING
CHITT ADJUSTABLE
RADIATOR HANGERS

THEY SAVE YOU TIME
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RUSSELL STORAGE HEATER

For supplying hot water for laundries, dye houses, office buildings, apartment houses, etc.

Entire tube bundle removable, if necessity requires.

Heating surface consists of straight tubes—No "U" BENDS—tubes easily replaceable.

Heaters furnished either welded or riveted shells.

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The Griscom Russell Co.

2155 West St. Bldg., New York

Banner Rock Wool Jacket

100% Fireproof

Hot Surface Insulation

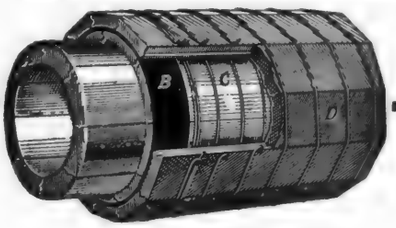
PURDUE UNIVERSITY at Lafayette, Indiana, made tests to determine relative transmission of various Heat Insulations. The results obtained are as follows:

Material	Heat Loss in BTU's per sq. ft. per deg. difference, per 24 hrs.
1" Rock Wool Jacket	4.886
1" Hair Felt	5.34
1" Rock Cork	5.623
1" 85% Magnesia	6.842
1" Asbestos Sponge Felt	7.104

Is Not Our "Jacket" Worth Investigating?

BANNER ROCK PRODUCTS CO., Alexandria, Ind.

QUALITY HEAT AND COLD INSULATION



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes with

Wyckoff's
Improved
Cypress Covering

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Absolutely water and steam tight. Each shell is wound with extra-heavy steel wire. Coated all over with the best known preservative—**Montezuma Asphalt.**

Write for catalog

A. WYCKOFF & SON CO.
ELMIRA, N. Y.

BAILEY METERS

BAILEY FLUID METERS record and totalize the flow of steam at any pressure or temperature, boiler feed, condensate, circulating water, or, practically any fluid flowing in a pipe. These meters are ideal for the measurement of low pressure steam as used for heating, because pressure and temperature records may be included on the same chart, giving the complete story of the steam supply. This makes it possible to calculate the actual B. T. U. supplied to a customer, and is conclusive evidence in case of any question regarding the supply. The pressure compensator has been in service for some little time. This device automatically corrects the totalizer readings for pressure changes, so that actual steam flow may be read directly from the meter.

BAILEY BOILER METERS accomplish more real results toward obtaining maximum efficiency and capacity from boiler operation than all other meters or instruments combined, because they record rate of Steam Flow from the boiler, the Rate of Air Flow through the furnace, and the Flue Gas Temperature on a single uniformly graduated chart. The Steam Flow shows the rate of steam production. The Air Flow shows the amount of air supplied for the support of combustion. The relation between these two records shows an excess or a deficiency of air supplied for the support of combustion. The Flue Gas Temperature is a sure indication of the condition of baffles and heating surface when considered in conjunction with the other records. Wind Box Pressure and Stoker Speed as well as a totalizer for the Steam Flow may be added.

BAILEY WEIR METERS record and totalize flow of water or other liquids through V-Notch weir and are used for feed water, hot well discharge or other fluids at or near atmospheric pressure.

Other Types of Meters as well as Recording and Indicating Gauges are made for different purposes, and nearly any problem in connection with the metering of fluids can be handled. Descriptive Bulletins sent on request.

BAILEY METER COMPANY
2037-E 46th ST. CLEVELAND, OHIO

PYRO-BESTOS

Underground Pipe Insulation

For piping from central heating plants or power stations to detached buildings of Universities, Asylums, Hospitals, Factories, etc. Also an underground Pipe Conduit for heating private Auto Garages direct from House heating systems.

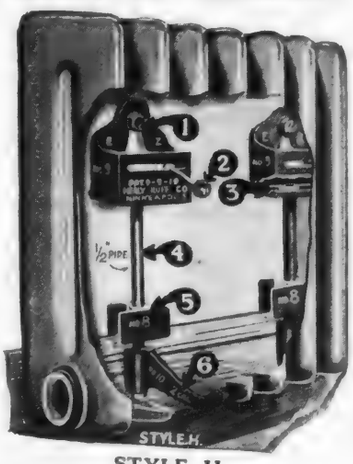
Cannot rot or decay no: will it retain moisture to rust and destroy the piping during non-heating season.

Saves most coal, sends dry steam to a greater distance and by reason of its advanced common sense method of installation is at the same time a lower cost per foot of pipe covered than any other Underground Pipe Insulation on the market.

National Asbestos Mfg. Co.

163-193 Henderson Street, Jersey City, N. J.

SIX IMPORTANT FEATURES of *E-Z* RADIATOR HANGERS



STYLE H

1. One Bolt
2. Invisible Washer
3. Horizontal Adjustment
4. Vertical Adjustment
5. **Adjustable for Baseboard**
6. Made for Wall, and Column Radiation

STYLE R
Without Baseboard Adjustment
Reasonable Price

Made for all styles of radiation

Manufactured by
HEALY-RUFF CO.,
Minneapolis, Minn.

No More Replacing of Hot Water Piping

THE corroding and rusting away of hot water piping every few years is expensive, and is really an extravagant, preventable waste, for by simply removing the dissolved air and oxygen in the water, the primary cause of such corrosion and rusting can be removed.

An Elliott Deaerator accomplishes practically complete removal of all dissolved oxygen and gases in the water, eliminating corrosion in the piping, including those other objectionable features—red water and stoppage of pipe. An Elliott Deaerator can be installed in a new building and you will be assured that the piping will last indefinitely. It can also be installed in an old building, and will not only prevent further corrosion, but will gradually work out of the system the products of corrosion that are already in the piping.

The Elliott Deaerator is simple and practical. Heated water is introduced and distributed in a region of vacuum, boiling explosively and giving up all dissolved oxygen and other gases.

This is real piping insurance. Let us present the facts.

Elliott Company

Pittsburgh, Pa.

General Sales Office: *Fourth Street, JEANNETTE, PA*

District Offices: New York Chicago Philadelphia Boston Cleveland Cincinnati Detroit St. Louis Kansas City Pittsburgh Syracuse

N-759-a

ELLIOTT

De-aer-ated water can't rust

Deaerator

A Railway for Ideas

TWO business concerns with the same physical equipment and opportunities may enter the field at the same time. Yet, within a year, one may forge far ahead of its competitor. You have seen it happen many times. Why? Because one had *better ideas*.

Business failures are nearly all failures of ideas. The ability to acquire and use the right ideas is the measure of success or failure.

For every idea you originate, thousands are originated by others. For every idea you *believe* may work, thousands are tested in the laboratory of experience.

LIST OF MEMBERS

Each has subscribed to and is maintaining the highest standards of practice in its editorial and advertising service.

Advertising and Selling
American Architect (The) Architectural Review
American Blacksmith, Auto and Tractor Shop
American Exporter
American Funeral Director (The)
American Hatter (The)
American Machinist
American Paint Journal
American Paint and Oil Dealer
American Printer (The)
American School Board Journal (The)
Architectural Record (The)
Automobile Dealer and Repairer
Automobile Journal
Automotive Industries

Bakers Weekly
Bakers' Helper
Boiler Maker (The)
Boot and Shoe Recorder
Brick and Clay Record
Buildings and Building Management
Building Supply News
Bulletin of Pharmacy (The)

Canadian Grocer
Canadian Machinery and Manufacturing News
Canadian Railway and Marine World
Candy and Ice Cream
Chemical and Metallurgical Engineering
Clothier and Furnisher (The)
Coal Age
Coal Trade Journal
Concrete
Cotton

Daily Metal Trade
Distribution and Warehousing
Domestic Engineering
Dry Goods Economist
Drygoodsman
Dry Goods Reporter

Electric Railway Journal
Electrical Merchandising
Electrical Record
Electrical World
Embalmers' Monthly (The)
Engineering and Contracting
Engineering and Mining Journal
Engineering News-Record

Factory
Farm Implement News
Farm Machinery—Farm Power
Fire and Water Engineering
Foundry (The)
Furniture Journal (The)
Furniture Manufacturer and Artisan

Garment Weekly
Gas Age (The) Record
Gas Record (The)
Grand Rapids Furniture Record (The)
Good Furniture

An idea developed in New York is of no use to a Californian unless he hears about it. That is why there must be "railways" for ideas, channels for the exchange of constructive thought.

Business Papers are the "IDEA RAILWAYS" which bring you the best ideas in the world interpreted in terms of your particular kind of business. They are hardly less important than the railways of iron and steel. Without "*Idea Railways*" to effect a "meeting of minds" no sales could take place, no goods could be shipped.

A Shipment for You

Think of the money this service makes for you—saves for you. Conceive, if you can, of the increased expense and the crushing handicap which would be imposed upon both you and the concerns from which you buy, were your "Idea Railways" to be abolished.

The advertisiers in these pages are progressive merchandisers, using the economical sales methods, made possible by this particular "Idea Railway." It pays to do business with people of this character.

YOU are invited to consult us freely about Business Papers or Business Paper Advertising

LIST OF MEMBERS

Haberdasher (The)
Hardware Age
Hardware and Metal
Heating and Ventilating Magazine (The)
Hide and Leather
Hospital Management
Hotel Monthly (The)
Hotel Review
Illustrated Milliner
Implement and Tractor Age
Implement and Tractor Trade Journal
Industrial Arts Magazine (The)
Inland Printer (The)
Iron Age (The)
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Lumber
Lumber Trade Journal (The)
Lumber World Review

Manufacturers' Record
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Marine Review
Millinery Trade Review (The)
Mill Supplies
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Modern Hospital (The)
Motor Age
Motorcycle and Bicycle Illustrated
Motor Truck
Motor World

National Builder
National Cleaner & Dyer
National Laundry Journal
National Lumber Merchant
National Petroleum News
Nautical Gazette (The)
Northwest Commercial Bulletin
Northwest Druggist

Oil News
Oil Trade Journal
Plumber and Steam Fitter
Power
Power Boating
Power Farming Dealer
Power Plant Engineering
Price Current—Grain Reporter
Printer's Ink
Purchasing Agent

Railway Age
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Retail Lumberman
Rock Products
Rubber Age

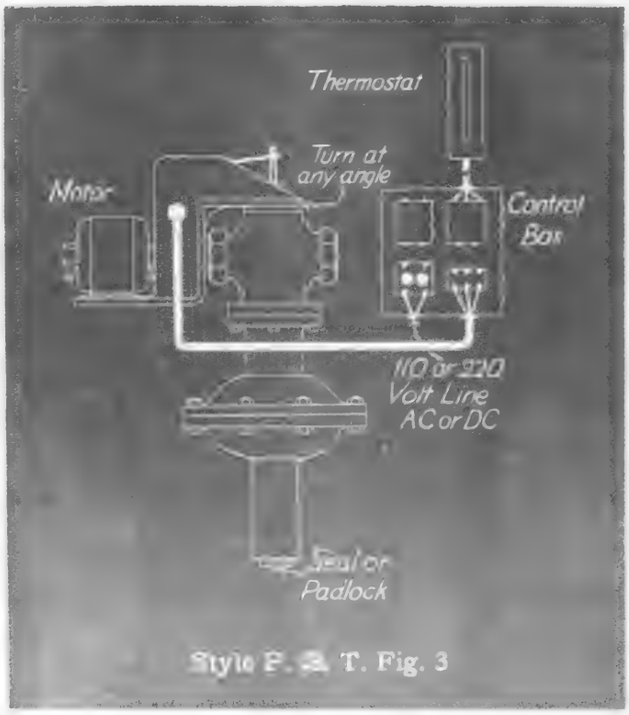
Sanitary & Heating Engineering
Shoe Findings
Shoe and Leather Reporter
Shoe Retailer (The)
Southern Engineer
Southern Hardware and Implement Journal
Sporting Goods Dealer (The)
Starchroom Laundry Journal (The)
Tea and Coffee Trade Journal (The)
Textile World
Welding Engineer
Wood-Worker (The)

THE ASSOCIATED BUSINESS PAPERS, INC.

JESSE H. NEAL, Executive Secretary

Headquarters: 220 West 42nd Street - - - - - - - - New York City

HORNUNG PRESSURE and TEMPERATURE CONTROL VALVES



MASTER CONTROL

The MASTER CONTROL was designed, and is especially adapted, for control of steam heat as served from a Central Heating Plant.

The MASTER CONTROL is a combination of two valves in one, in which the lower diaphragm operates to control the pressures while the motor mounted on top of the valve operates to close off the steam when no heat is required in the building.

These valves are made interchangeable so that the MOTOR DRIVEN TEMPERATURE CONTROL may be attached to the PRESSURE CONTROL at any time.

The temperature control is also furnished without the pressure control diaphragm.

The MASTER CONTROL valve has been in use for twelve years and the saving it brings to the customer is clearly a matter of record.

A 30% reduction in the meter bill is a conservative average.

CENTRAL HEAT APPLIANCES

343 South Dearborn Street J. C. HORNUNG CHICAGO, ILL.

Save $30.00, $50.00 or more

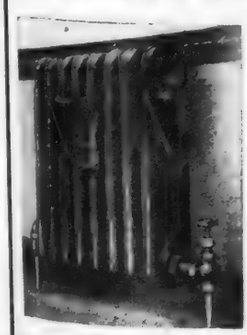
This Hand Book Tells How to do it

Reducing valves should be bought SCIENTIFICALLY, on a steam capacity basis only. Atlas Type "A," for example, will handle 2930 lbs. per hour, net cost $37.40, whereas a diaphragm operated valve of the same capacity will cost $60. This new hand book explains it all. Ask for a copy

We make regulating valves for every service

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street Newark, N. J.

HARTMANN RADIATOR BRACKETS



WHY ?

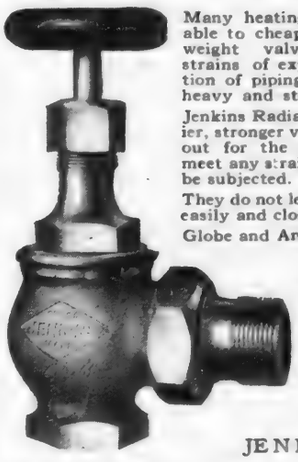
LABOR SAVED
NO WALL STRIPS
NO BREAKAGE
NO DIRT
INEXPENSIVE

Send for descriptive circular

CHARLES HARTMANN CO.
Sheet Metal Constructors
985 Dean St., Brooklyn, N.Y.

TRADE JENKINS MARK Jenkins Bros

To keep good a good heating system



Many heating troubles are traceable to cheaply constructed light weight valves. To stand the strains of expansion and contraction of piping, a valve must be heavy and strong.

Jenkins Radiator Valves are heavier, stronger valves, made throughout for the severest service, to meet any strain to which they may be subjected.

They do not leak. May be opened easily and closed tightly.

Globe and Angle Radiator Valves, with wood wheels—various body finishes. Fitted with Jenkins Renewable Disc.

Know the genuine by Jenkins "Diamond" and signature.

JENKINS BROS.

Fig. 168. Jenkins Brass Angle Radiator Valve, with union.

New York Boston Philadelphia Chicago
Montreal London

Jenkins Valves
SINCE 1864

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.
Nash Engineering Co., So. Norwalk, Conn.

AIR CONDITIONING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Buckeye Blower Co., Columbus, O.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
W. L. Fleischer Co., New York, N. Y.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Company, New York.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
W. L. Fleisher Co., New York, N. Y.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

AIR ELIMINATORS.
Jas. P. Marsh & Co., Chicago, Ill.

AIR SEPARATORS.
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Buffalo, Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
W. L. Fleisher Co., New York, N. Y.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

AUTOMATIC SPRINKLERS
Grinnell Co., Inc., Providence, R. I.

BLOWERS.
FAN.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Porbeck Mfg. Co., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

PRESSURE.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

ROTARY.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg Co., New York.

TURBINE.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

BOILER BREECHINGS.
Hartmann Co., Charles, Brooklyn, N. Y.

BOILERS.
COPPER.
Dahlquist Mfg. Co., Boston, Mass.

DOWN-DRAFT.
American Radiator Co., Chicago, Ill.
The Brownell Co., Dayton, O.
Chicago Down Draft Furnace Co., Chicago, Ill.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.

HEATING.
American Radiator Co., Chicago, Ill.
The Brownell Co., Dayton, O.
Central Radiator Co., New York.
Cox Stove Co., Abram, Philadelphia, Pa.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.
Utica Heater Co., Utica, N. Y.

POWER.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
Sarco Co., New York.
Schaefer & Budenberg Mfg. Co., Brooklyn, N. Y.

COILS, PIPE.
Buckeye Blower Co., Columbus, O.
Simmons Co., John, New York.

AIR.
New York Blower Co., Chicago, Ill.

COOLERS.
OIL.
Griscom-Russell Co., New York.

CONDENSERS.
Alberger Heater Co., Buffalo, New York.
Alberger Pump & Condenser Co., New York.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, HOT WATER.
Patterson-Kelley Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

COVERING, PIPE.
America District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, New York.
W. L. Fleisher Co., New York, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DISTILLERS, (water).
Griscom-Russell Co., New York.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS.
Atmospheric Conditioning Corp., Phila., Pa.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST DETERMINATORS.
Atmospheric Conditioning Corp., Phila., Pa.

ECONOMIZERS, FUEL.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

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Buckeye Blower Co., Columbus, O.
Hartmann Co., Charles, Brooklyn, N. Y.

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American Blower Co., Detroit, Mich.
The Brownell Co., Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EVAPORATORS.
BOILER FEED MAKE-UP.
Griscom-Russell Co., New York.

EXHAUST HEADS.
Burt Mfg. Co., Akron, O.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley, Co., New York.
Simmons, Co., John, New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wright-Austin Co., Detroit, Mich.

EXPANSION JOINTS.
Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

FANS, EXHAUST.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo, Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

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Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

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American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, New York.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., N. Y.

FURNACES, WARM AIR.
Twin Fire Furnace Co., Chicago, Ill.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
McAlear Mfg. Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

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American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

HYDRAULIC.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

OUNCE GRADUATED.
Jas. P. Marsh & Co., Chicago, Ill.

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American Steam Gauge & Valve Mfg. Co., Boston, Mass.
American Dist. Steam Co., North Tonawanda, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
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Webster & Co., Warren, Camden, N. J.

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Bishop & Babcock Co., Cleveland, O.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

WATER.
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
American District Steam Co., No. Tonawanda, N. Y.
Capitol Brass Works, Detroit, Mich.
Detroit Lubricator Co., Detroit, Mich.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Sturtevant Co. B. F., Hyde Park, Boston, Mass.
Typhoon Fan Company, New York.

GENERATORS, (Heat)
Honeywell Heatng Specialties Co., Wabash, Ind.

GOVERNORS, (pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
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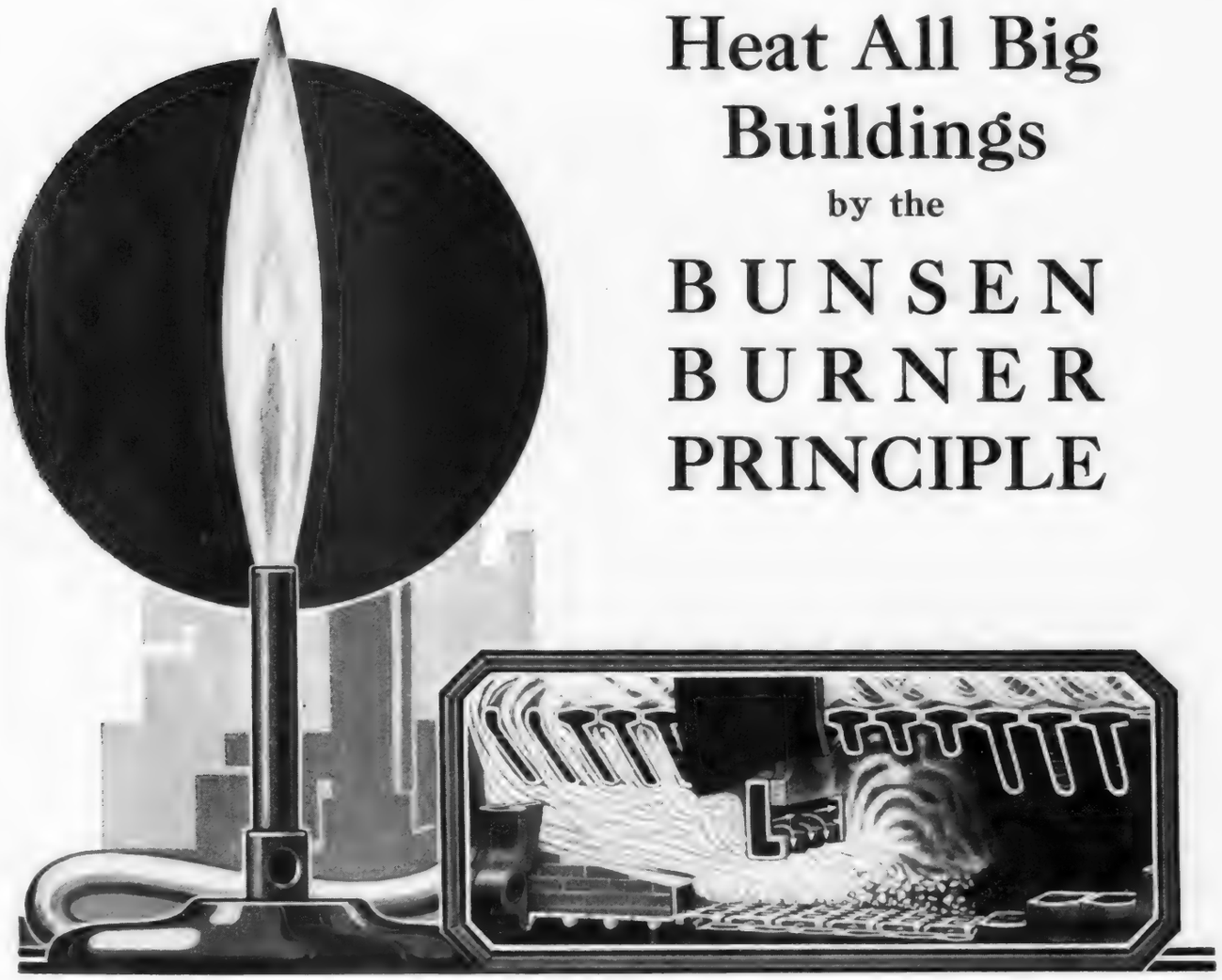

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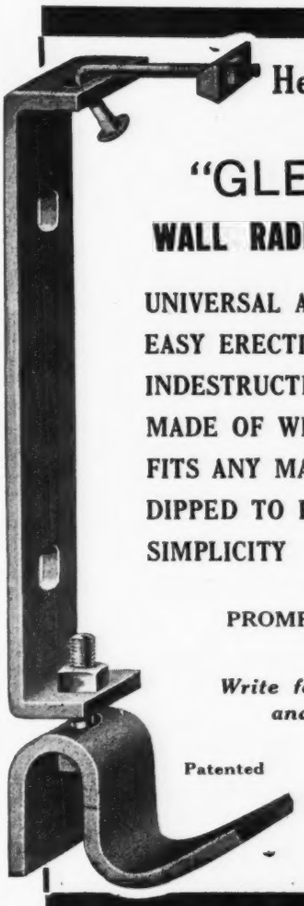

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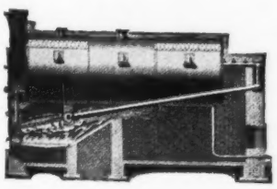

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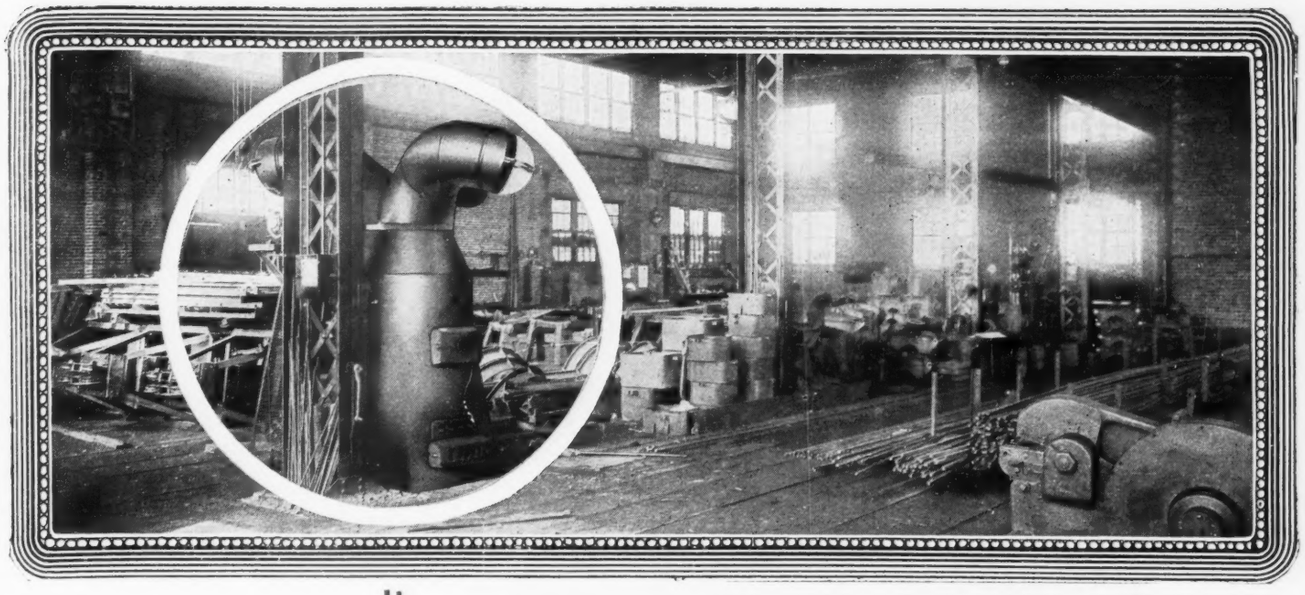

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